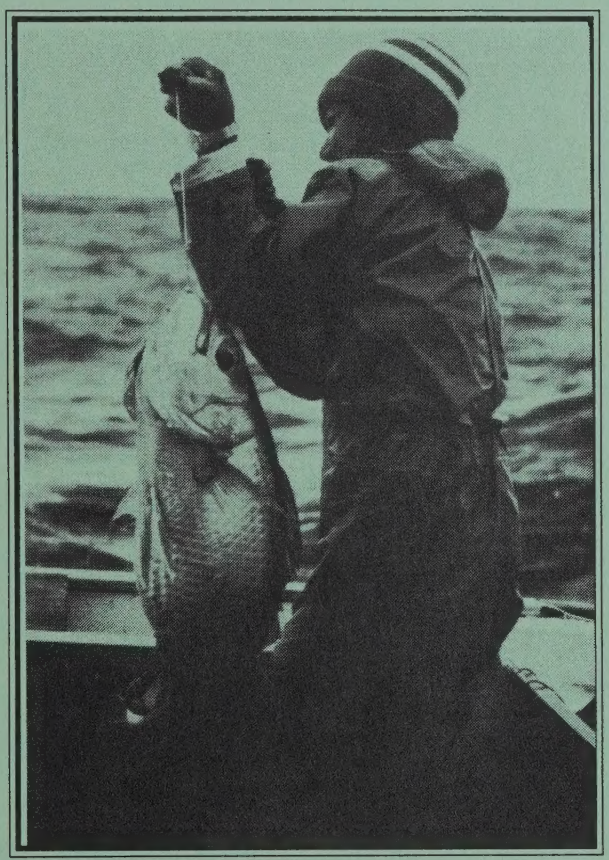
Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region

1989 Annual Report



August 1990

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Prepared by the Plan Team for the

Western Pacific Regional Fishery Management Council

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1989 Bottomfish Annual Report

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1989 Annual Bottomfish and Seamount Groundfish Report
Prepared by
Bottomfish Plan Monitoring Team
June 1990

Introduction

During 1989 the Council began an in-depth examination of the FMP monitoring and assessment process. At a workshop held in November 1989, participants agreed that the annual reports should be streamlined, with greater emphasis on analysis of indicators than had been presented with the module approach of previous years.

In February, 1990 the Plan Monitoring Team (PMT) met to discuss what elements were necessary to present information on the status of the fishery and the stocks in a clear and concise manner. A set of fishery descriptors and indicators were identified. The descriptors are designed to give a reader a basic understanding of recent trends in landings, effort, participation, revenue and prices for the bottomfish fisheries of American Samoa, Guam, Hawaii and and the Northern Marianas. In addition, should management action be recommended the descriptor information provided will aid in assessing the potential impacts of the action on fishery participants. The indicators, on the other hand, are quantifiable and measurable tools used to identify signs of stress in the stocks or the fishery. It is on the basis of these indicators that the Team may identify "yellow light" situations and recommend that either management action or additional study be undertaken.

This year's report is organized in the following manner: First a brief description of each descriptor and indicator is provided. Team recommendations based on analysis of indicator criteria and data needs follow. Next, the available descriptors and indicators for each island area are presented. Each figure is accompanied with a description of the data source, method of calculation, and interpretation, if any. Finally, a series of reports on habitat conditions, 1989 NMFS administrative actions, the first year of implementation of the limited entry program in the Northwestern Hawaiian Islands, protected species interactions, 1989 enforcement activities, and consumer price indices for the Western Pacific are provided as appendices.

Descriptors

The fishery descriptors include by the following types of information:

Landings Information: Time series information on aggregate catch for each of the areas show recent trends in total bottomfish harvest. For the MHI and the NWHI, changes in species catch composition is also provided. For 1989 only, pounds landed, by species, are presented in tabular form.

Effort Information: Effort is measured in number of trips for Hawaii, and the CNMI, and in both hours fished and trips taken for American Samoa and Guam.

Participation Information: Estimates of the number of vessels making bottomfish landings over the past several years are provided for all areas except Guam.

Economic Information: Time trends in economic performance are characterized by plots of total ex-vessel revenue generated, aggregate average price levels, and price trends over time for major species. In time-series of prices and revenues, it is appropriate to adjust value for the rate of inflation so that values throughout the time period are comparable (based on a consistent purchasing power for the dollar). For each of the areas, both the unadjusted and adjusted aggregate average price is plotted to give the reader a better picture of the relative change in price paid over time. For Hawaii, both unadjusted and adjusted ex-vessel revenue is also provided. For information on Western Pacific consumer price indexes see Appendix 5.

Indicators

Indicators were developed as tools for identifying signs of stress in the stocks or the fishery which deserve further investigation and/or a management response. The Plan Team has developed the following indicators:

Time Trend in Aggregate Catch Per Unit Effort (CPUE): If the current year's aggregate CPUE is less than 50 percent of the average aggregate CPUE for the first 3 years of available data, then there may be some cause for concern. CPUE information is available for all areas, and, in addition, research CPUE is available for SE Hancock Seamount.

Time Trend in Mean Size: If there has been a significant reduction in mean size of individual fish for a species over time, the stock may be stressed by the fishery. Mean Size information is provided for 7 species in Hawaii, 11 in Guam and 2 in American Samoa. No mean size information was available at this time for the Northern Marianas.

Percent of Catch less than the Size at Maturity: If over 50 percent of the catch is less than the size at maturity, a stock may be stressed by the fishery. Due to the lack of size at maturity information for species in American Samoa, Guam and the CNMI, this indicator is provided only for the Hawaii fisheries.

Time Trend in Spawning Potential Ratio (SPR): The SPR is the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing. When amendment 3 to the Bottomfish FMP becomes effective, if SPR is less than or equal to 0.2 recruitment overfishing has occurred. This year this indicator is provided only for the Main Hawaiian Islands.

Time Trend for Economic Indicators: The two economic indicators selected by the PMT were revenue per trip and cost per trip. Revenue per trip plots are presented for all areas. Cost per trip information is available for the NWHI fishery only. A more valuable indicator for the commerical fisheries which may be available in the future would be net revenue (ex-vessel revenue minus costs).

Analysis of Indicators

American Samoa: CPUE has been generally increasing since 1985 although the CPUE declined in 1989 compared to 1988. This decrease may be due to a combination of some new, inexperienced boats entering the fishery and the decreased percentage of commercial fishermen. The 1989 aggregate CPUE was greater than that recorded in the first three years of available data (1982-1984). The time series of mean size for taape and emperor was too short and the sample size too small to provide much useful information. **Based on the indicator criteria provided, no "yellow light" situations were identified and no management action is recommended at this time.**

Guam: The CPUE has fluctuated but has not shown any sustained change. The mean size data available for the past 10 years do not indicate much decline for any of the eleven species examined. **Both the CPUE and the mean size indicators suggest that no management action needs to be taken at this time.**

Main Hawaiian Islands: The general trend in MHI CPUE is decreasing, with current values approximately half that of initial. The mean weight indicator proved difficult to interpret. Some species show decreasing trends, some increasing and still others have remained fairly stable. MHI onaga catch had the highest percentage of immature fish, and is the only species where the percent of the catch immature was consistently over 50 percent, suggesting a "yellow light" condition. The SPR indicator was calculated for five major species. SPR estimates for all of these species are above the 20 percent "critical" level and therefore are not considered. recruitment overfished at this time. **Based on all of the indicators taken together, the PMT has concern that some species may be in a stressed condition and recommends tht the Council being to evaluate alternative management measures.**

Northwestern Hawaiian Islands: CPUE data is only available for the fishery since 1986. The CPUE has been steadily decreasing since 1987. Like the MHI, mean weight trends vary from species to species. In general, mean weights of fish in NWHI are larger than those in MHI catch. All of the five major species assessed (opakapaka, onaga, ehu, uku and ulua) had less than 50 percent immature fish in the catch. **Again, no management action is recommended.**

Northern Marianas Islands: The CPUE for the CNMI was calculated on a per trip basis where a trip could both vary in length and be multi-fishery in nature. Because of this the catch per trip information is not a very good measure of CPUE. Variations in the time trend were heavily

influenced by a few boats who shifted their mode of operation in terms of length of trip and fishing strategies. There has been an increasing emphasis on catching pelagic species rather than bottomfishing during multi-gear trips in recent years. **The indicators do not suggest the need for any management action.**

Recommendations

Based on the indicators analyzed, no management action is recommended for any of the fisheries at this time. However, a number of the indictors for MHI species point to a yellow light condition. Therefore, the PMT recommends that the Council begin to evaluate alternative managment measures directed at protecting those stocks which may be in a stressed condition.

In producing the report in its new format, with emphasis on indicators, a number of administrative and data needs were identified. The Team will be working on outlining specific projects and estimating funding levels required to carry out data collection and analysis tasks during the next few months. The following are administrative and data needs which must be addressed in order to provide complete and accurate descriptor and indicator information for each area (see Table 1 for summary):

American Samoa

The Council, NMFS, and fisheries offices of all the areas under the Council's jurisdiction should provide financial and /or administrative assistance to facilitate the completion of software, written by WPACFIN staff, which would provide the data and analyses required by the Planning Teams. Completion of this job would liberate the PMT members to perform more profound interpretations of the available statistics.

Several species included in the Plan Team's analysis of American Samoa's bottomfish fisheries are not among those listed in the bottomfish FMP. Selection criteria should be established and applied to the unlisted fish to determine which, if any, should be included in the list of management unit species.

American Samoa's fishery regulations, which were officially passed into law on May 16, 1990 give the DMWR data collectors better leverage to collect data from local fishermen and commercial outlets. The Planning Team needs biological information as well as catch and effort data to effectively monitor the fishery. It is, therefore, recommended that the DMWR hasten its efforts in obtaining fisheries data from fishermen and commercial outlets as required by the new fishery regulations.

Information describing American Samoa's bottomfish resource and its fishery is limited to catch and effort data of varying levels of quality, from the beginning of the fishery to present and some biological data in the most recent years. Resources must be applied to filling the existing data gaps to adequately address the overfishing issue. Specific data and analysis needs include:

1. Reconstruct virgin stock CPUE and for the shallow water bottomfish complex and size distribution for key species by fishing in unexploited areas.

2. Establish MSY estimate for the shallow water complex.

3. Determine size at maturity for key species.

4. Collect length data from key species.

Guam

Currently Guam's bottomfish fishery emphasizes shallow water species. The red-gilled emperor was the single most important bottomfish species during 4 of the last 5 years (5-34% of the catch). For this reason there is a serious need to fully understand the biology and status of the stock for this species which plays an important tole in both Guam and Northern Marianas fisheries. At present little is known about the reproductive biology, the size at maturity and size distribution of this species. A study collecting virgin stock CPUE information in the CNMI coupled with a vendor sampling contract to gather size frequency and size at maturity information on Guam could provide the necessary data to overcome this lack of knowledge.

A considerable amount of data was collected by the Honolulu NMFS Lab during the RAIOMA project which sampled the deep water bottomfish fishery throughout the Marianas. To date neither CNMI nor Guam has access to this data. It is possible that if this data is further assessed that some of the data needs for specific important deep water bottomfish could be resolved. Funding may be required to process and analyze this data.

For many years NMFS in Honolulu has coordinated, collected and analyzed Guam's commercial fisheries data. The DAWR is presently in the process of taking responsibility for this program, but computer and personnel needs will require additional funding to make this program fully operational.

The PMT has been plagued with establishing stock production ratios for BMUS. One solution which may alleviate some of the difficulties in obtaining the values would be to establish age studies for both shallow-water and deep-water fisheries using otoliths.

Hawaii

Commercial Fisheries: The NWHI bottomfish logbook program should continue as this could possibly be the best source of detailed data on the landings and effort needed for stock assessment purposes. More effort will have to be put into fishermen contacts to ensure accurate data. Elimination of the burden of also filling out the State catch report should be investigated.

Collection of market data should be expanded to provide a broader base for improved expansion factors. Data are needed primarily from the islands of Maui and Kauai as these are areas that have large numbers of bottomfish vessels.

A study is needed to estimate the amount of fish that is not being reported to the State or monitored by the NMFS. The drop in bottomfish landings from Hawaii and the availability and improved quality of Pacific island and other foreign snappers has increased the quantity of fish imported into Hawaii. These imports should be monitored more closely as they have a direct effect on the price structure of the local bottomfish markets.

The export of fish in general seems to have increased over the last few years. National marketing efforts by the Hawaii Seafood Promotion Committee and the State of Hawaii's Department of Business and Economic Development (DBED) have resulted in increased interest in Hawaiian fish. Monitoring of these exports is currently not being done. A study on the exports is needed to complete the picture of the Hawaii market.

Some pieces of this puzzle may be answered by the wholesaler survey to be conducted in 1990 by NMFS personnel. This would give a snapshot of the current activities but an ongoing data monitoring system needs to be designed to determine long-term trends in the market.

An integration of all of the NMFS data sources should be completed to provide a more complete picture of the landings and value of Hawaii's fisheries.

Recreational Fishery Information: Creel surveys in Guam and American Samoa currently provide good information on the recreational fisheries in these areas. However, in Hawaiian fisheries catch and effort information on the recreational components are virtually non-existent. The small boat survey currently in progress will provide a rough estimate of the magnitude of the Oahu recreational fishery but in order to provide useful information on relative impacts of alternative management measures routine data collection is needed.

Northern Marianas Islands

Critical data needs for describing the bottomfish fishery in the CNMI include size frequencies for all deep and shallow species, size at maturity, reliable age estimates, and catch per unit effort (CPUE). Collection of this data will require changes in the sampling design presently used. The commercial reporting system in use does not adequately provide much of the information needed. Creel survey data is also inadequate.

Size frequency and length-weight data for various deep water species, principally snappers (Lutjanidae) and groupers (Serranidae), and shallow water species, principally emperors (Lethrinidae) and groupers, are urgently needed. Groupers, particularly shallow water species present on offshore banks, are being targeted, regardless of body size. Juvenile fishes are

appearing in the markets. Lethrinids, particularly Lethrinus rubrioperculatus, make up a significant portion of the bottomfishery, yet little is known about the size at maturity. Sex ratio data is needed for examining the relationship between size frequency distributions and size at maturity. This is especially true for species which may undergo sex change, such as groupers (female to male) and some lethrinids (male to female). This information can also be examined in relation to age determinations made from otoliths. Spawning cycles, inferred from examinations of gonad states in relation to lunar and seasonal influences, will provide estimates of reproductive potential in variously-sized species. Fecundity data may be extracted from examinations of ripe females sampled.

Catch per unit effort data must be obtained from essentially "virgin" grounds, so that baseline estimates can be compared with CPUE values obtained for each species in the fishery. Reliance upon those values obtained from the RAIOMA program alone is clearly not enough.

Table 1
Administrative and Data Needs Identified
By The Bottomfish Plan Monitoring Team
(Not in order of priority)

	Am Samoa	CNMI	Hawaii	Guam
Computer programming for annual data compilation & analysis	X	X	X	X
More complete commercial landing data collection	X	X	X	X
Import/Export Monitoring	X	X	X	
Age/Size at Maturity	X	X	X	X
Establish baseline (unfished) CPUE	X	X		X
Length-frequency data	X	X		X
Analysis of existing data		X		X
Age estimates	X	X	X	X
Sex Ratio data		X		X
Recreational catch & effort information			X	

American Samoa
1989 Descriptors and Indicators

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Percent Catch Immature	Not Available
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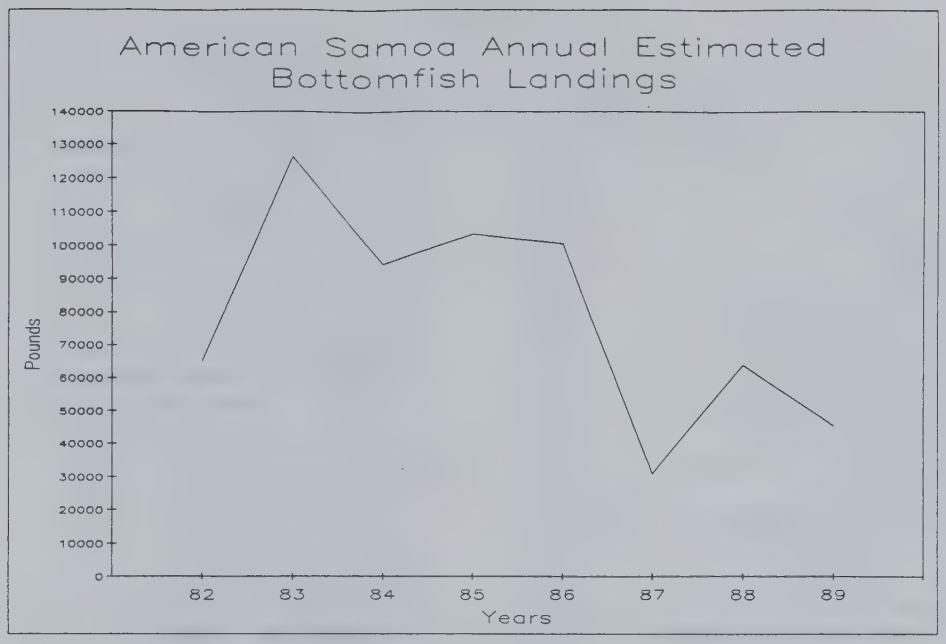
Spawning Potential Ratio	Not Available
Revenue Per Trip	AS-11



Calculations: Bottomfish landings for 1982-84 are calculated by adjusting the sampled Tutuila data by the calculated annual percent coverage of the fleet, and then adding the similarly adjusted Manu'a landings to it. The 1986-present landings are from the creel survey expanded species composition files (.SPC) which contain the annual estimated total landings by species for Tutuila, and then adding the adjusted Manu'a landings. Calculating statistics for 1985 is more complicated because the sampling program changed from commercial fleet sampling only to creel sampling on October 1, 1985. Basically, monthly adjustments are made based on percent coverage for January to September, and the October to December .SPC files are added, and then the adjusted Manu'a data are added.

Interpretations: The substantial decline in landings in 1987 was partially due to vessel losses caused by a hurricane. Generally speaking, however, the bottomfish fishery is obviously much smaller in the past 3 years than it was any time between 1982 and 1986.

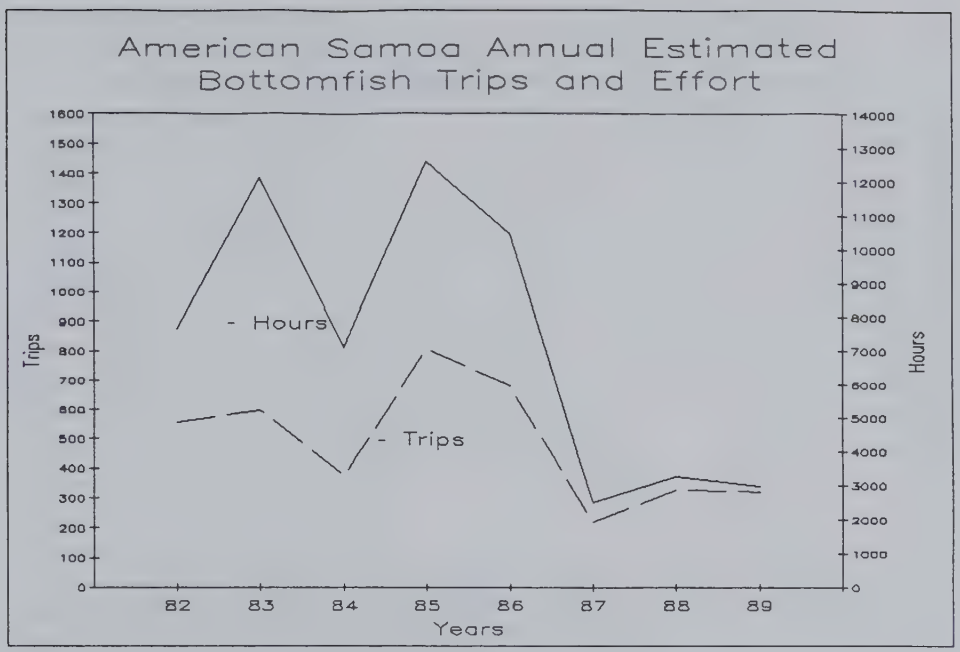
Table 1

American Samoa 1989 Estimated Total Bottomfish Landings

Species	Pounds	Species	Pounds
Jacks	2660	Humpback snapper	2680
Black jack	1448	Brown jobfish	28
Trevally	489	Gray jobfish	3033
Groupers	2209	Deepwater bottomfish	447
Peacock grouper	978	Hawaiian opakapaka	278
Flagtail grouper	129	Opakapaka	364
Tomato grouper	575	Blue lined gindai	14
Blacktip grouper	83	Gindai (flower snap)	559
Yellowspot grouper	116	Lehi (silverjaw)	1454
Spotted grouper	925	Onaga (red snapper)	1465
Smalltooth grouper	27	Ehu (red snapper)	1291
Giant grouper	385	Bigeye emperor	26
Lunartail grouper	3594	Emperors (misc)	1907
Blue lined snapper	7306	Longnose emperor	1954
Rufous snapper	434	Ambon emperor	1358
Onespot snapper	193	Blueline bream	58
Twinspot/red snapper	1713	Orangespot emperor	49
		Redgill emperor	5049
Total Bottomfish:	45278		
Total BMUS :	34505		

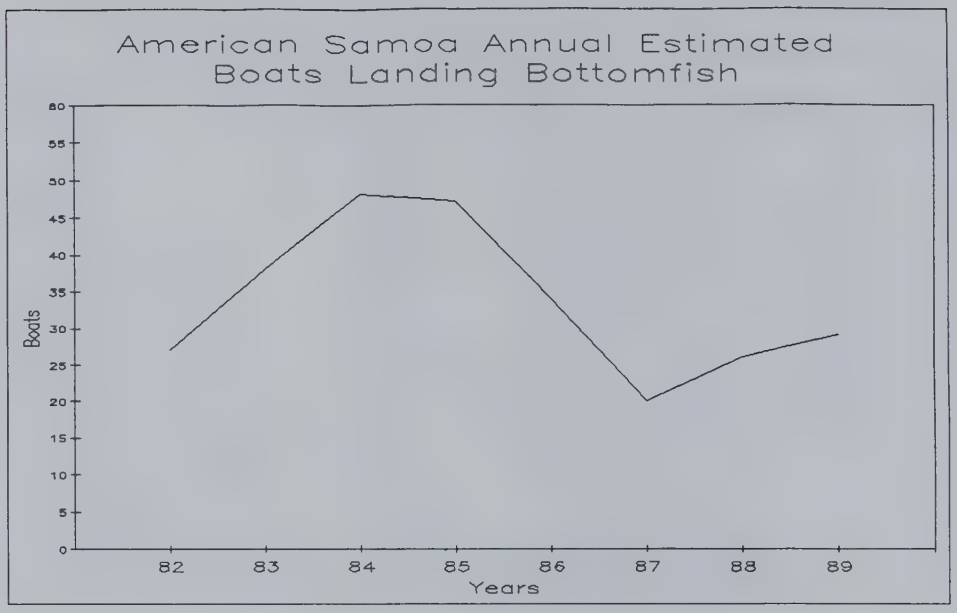
Because of variability among years of the percent of the total sampled bottomfish catch that was identified to the species level, and because the bottomfish complex in American Samoa contains many more species (some important) than specified in the FMP, analyses of American Samoa bottomfish data are for the whole complex, not just the BMUS.

For 1982-85 sampling was done on the commercial fleet only (which was nearly all the fishing boats in those days), whereas since 1985 creel sampling has covered all boats. In the early years of the bottomfish fishery, virtually all bottom fishing was done by commercial boats. Analysis of creel data for 1986-87 indicates that over 98% of the landed bottomfish were still being sold. This percent decreased in subsequent years as the number of non-commercial boats has increased. Therefore, it is believed to be valid to compare commercial data for years prior to 1986 to creel totals for years since 1986.



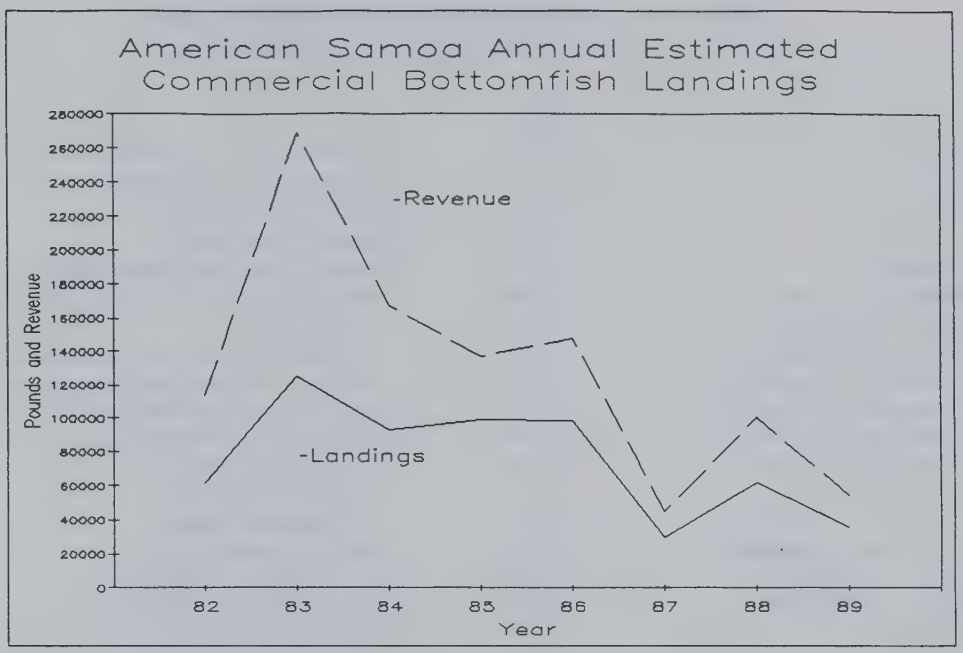
Calculations: The annual estimated effort (hours) spent bottomfishing is calculated by dividing the annual estimated total bottomfish catch by the average CPUE (pounds per hour) from trips doing only bottomfishing. The annual estimated number of trips is calculated by dividing the estimated annual hours by the average length of a bottomfishing trip. The average length of a bottom fishing trip (not shown) is calculated by using only trips which exclusively bottom fished and for which the trip length was recorded. The total hours fished from those trips is then divided by the number of trips.

Interpretations: The sharp decline in the bottomfish landings since 1986 noted in Figure 1 is mirrored in this figure by the sharp decline in the level of effort expended in that fishery. This does not necessarily suggest a problem with the resource, but does depict an actual trend of commercial boat owners and fishermen seeking other more lucrative and stable lines of work.



Calculations: The level of sampling is so high and the total number of boats in Samoa so low, that the number of boats actually sampled in any year is virtually a census. Therefore, the annual estimate of the number of boats in the bottomfish fishery is simply obtained from the data base by counting the unique boats sampled during the year which landed any bottomfish species.

Interpretations: Again the decline in the fishery since 1985-86 is noted by a decline in the number of boats participating in it. The 1987 hurricane caused loss of all of the Manu'a fleet, plus some of the Tutuila fleet.



Calculations: A relatively straightforward, but complex, set of algorithms are used to estimate the commercial landings from the estimates of total landings created by the creel survey data expansion system. In short, the percent sold by fishing method is calculated monthly and multiplied by the percent species composition by month and then multiplied by the estimated total landings for that method and month, and the results are written to a data base. The estimated commercial landings of all bottomfish species are summed from that data base, as is the estimated revenue.

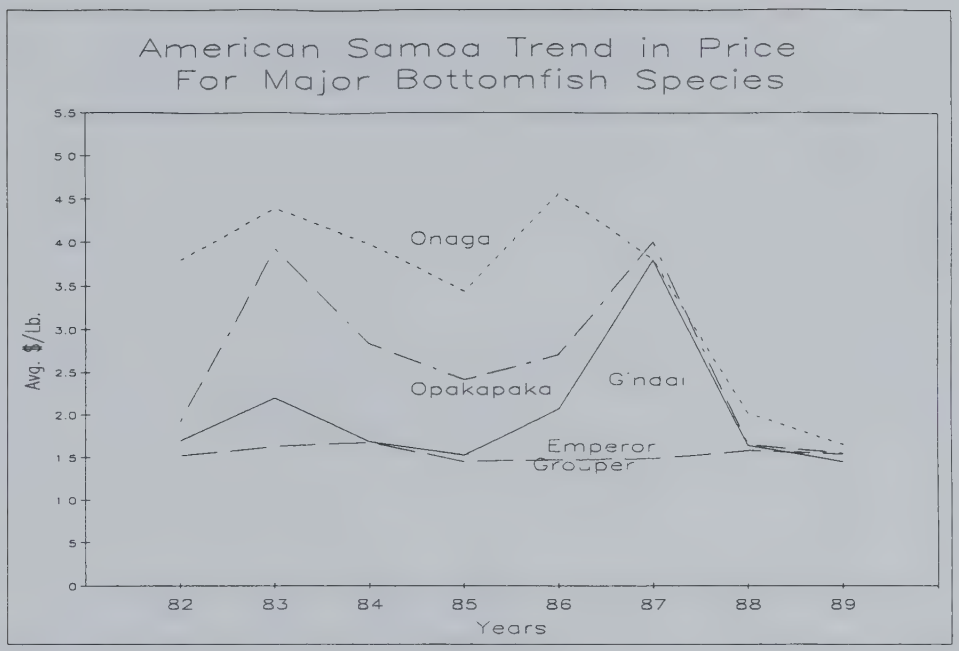
Interpretations: Commercial landings mirror the total fishery in showing declined catches in recent years. In fact, relative to total landings, commercial landings decreased even more substantially in 1989 because the percent of the catch sold by bottom fishermen dropped from an average of about 95-98% in 1982-88 to only 78% in 1989. The peak in 1983 portrays the high prices of deep water snappers exported to Hawaii. The trough in 1987 can be attributed to the effects of the 1987 hurricane.

Table 2

American Samoa 1989 Estimated Average
Price of Bottomfish Species

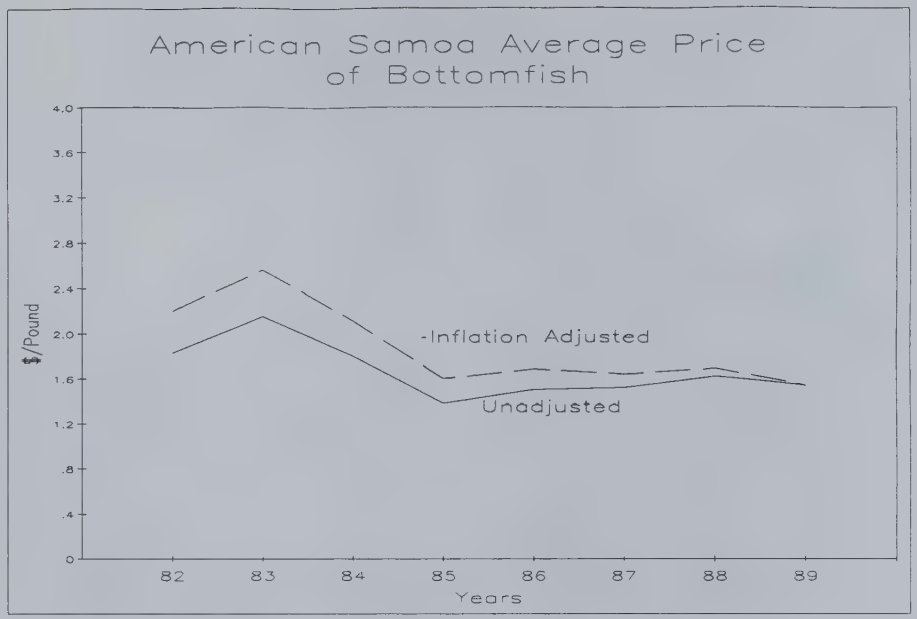
Species	$/Lb.	Species	$/Lb.
Jacks	1.34	Humpback snapper	1.50
Black jack	1.59	Brown jobfish	1.76
Trevally	1.50	Gray jobfish	1.67
Groupers	1.50	Deepwater bottomfish	1.28
Peacock grouper	1.58	Hawaiian opakapaka	1.48
Flagtail grouper	1.51	Opakapaka	1.61
Tomato grouper	1.41	Gindai (flower snap)	1.45
Blacktip grouper	1.50	Lehi (silverjaw)	1.64
Yellowspot grouper	1.51	Onaga (red snapper)	1.65
Spotted grouper	1.54	Ehu (red snapper)	1.59
Smalltooth grouper	1.50	Bigeye emperor	1.56
Giant grouper	1.49	Emperors (misc)	1.58
Lunartail grouper	1.59	Longnose emperor	1.43
Blue lined snapper	1.54	Ambon emperor	1.51
Rufous snapper	1.50	Blueline bream	1.59
Onespot snapper	1.41	Orangespot emperor	1.65
Twinspot/red snapper	1.38	Redgill emperor	1.58
Bottomfish $/Lb. :	1.54		
BMUS $/Lb. :	1.55		

Calculations: When data are collected, the disposition of the catch is recorded, and if it is sold, the price is obtained whenever possible. The average prices reported in this table are calculated by dividing the total revenue by the sold weight in pounds for each species.



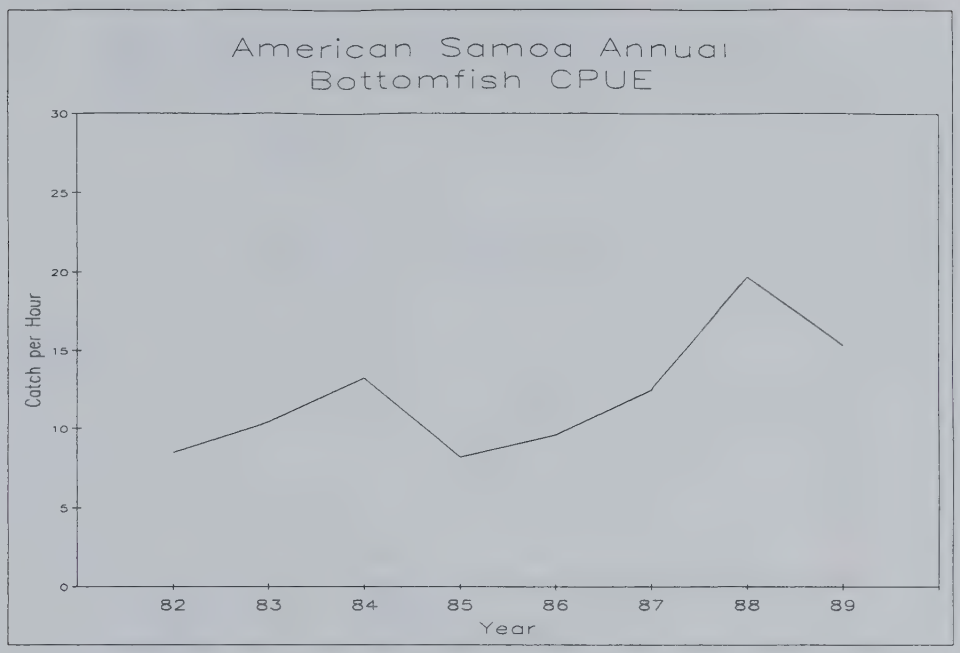
Calculations: The total revenue for a given species is divided by the total sold weight of that species to give the annual average price per pound.

Interpretations: Between 1982 and 1987, varying quantities of fresh, deep water snappers were exported to Hawaii and sold at the United Fishing Agency (UFA) auction. Average prices for bottomfish at the UFA are always higher than those offered by local markets. In 1988 and 1989 virtually all fish were sold locally, and therefore the average price of the typically expensive deep water snappers dropped after 1987. The average price of the emperor fishes shows virtually no change over time since they have never been exported.



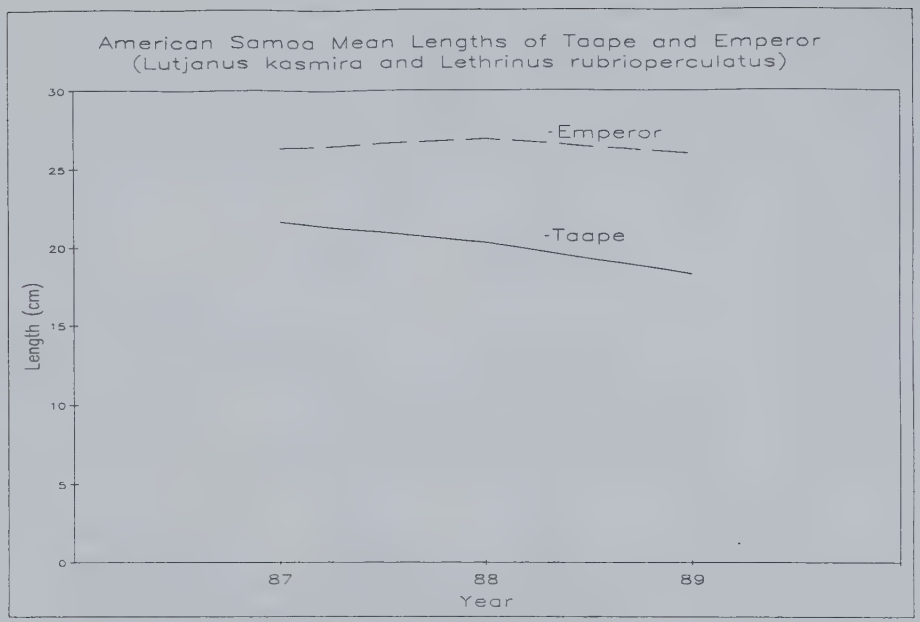
Calculations: The average price of all bottomfish species combined is calculated by dividing total bottomfish revenue by total sold weight. The inflation adjusted price is calculated by multiplying the unadjusted annual average price by the annually calculated consumer price index (CPI) for American Samoa using the current year as the base. For example, the CPI for 1989 was 120.25 and that for 1985 was 103.725 (using 1982 = 100). To calculate the inflation adjusted average price for 1985, multiply the unadjusted average price for 1985 by the 1989 CPI and divide by the 1985 CPI.

Interpretations: Although the unadjusted average price shows a slight general increase since 1985, the inflation adjusted average price shows no show increase. Prices have been relatively stable since 1985.



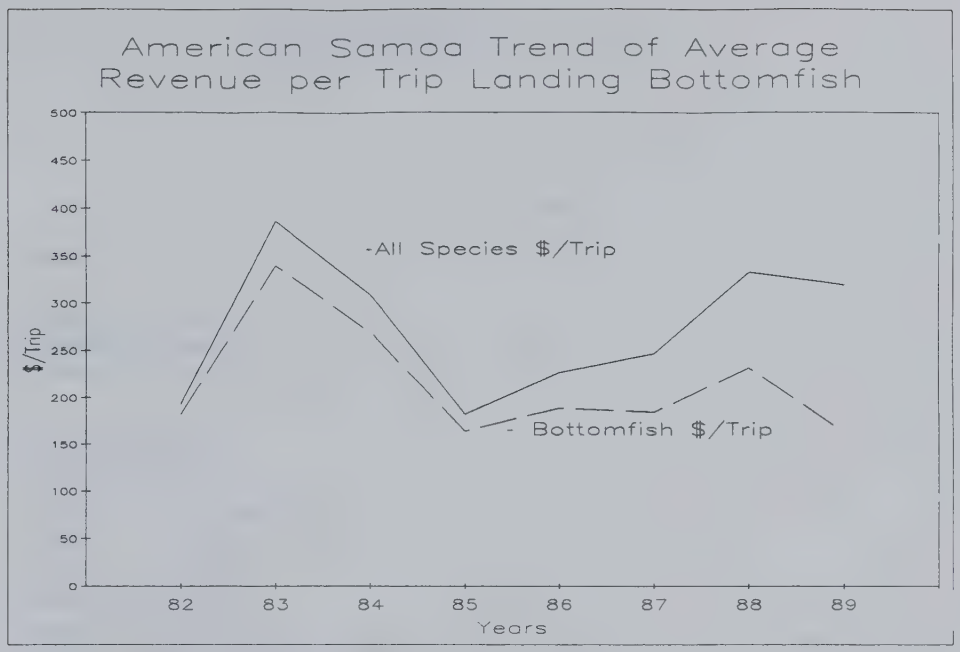
Calculations: Catch per hour is calculated using only those trips which only bottom fished and recorded effort in hours. The average is calculated by using each CPUE from each trip as an observation and dividing by the number of trips.

Interpretations: The decline in the fishery does not appear to be a result of decreased CPUE, as CPUE has generally been increasing since 1985 when the landings began to decline. The exception is the current year, which shows a decreased CPUE. Perhaps this was due to a combination of some new, inexperienced boats entering the fishery (Figure 3) and the decreased percentage of commercial fishers.



Calculations: Mean length was calculated by dividing the total measured length by the number of individuals measured.

Interpretations: The time series is too short, the size range too broad, and the sample size too small to make any interpretations. The DMWR should greatly improve it's size frequency sampling program, now that new fishery regulations requiring fishers and commercial outlets to provide access to catches have been passed into law.



Calculations: The average revenue per trip for all species is calculated by summing the revenue of all sales for any trip which landed any bottomfish species, and dividing by the number of trips. The average bottomfish revenue per trip is calculated from those same trips by summing the sales of only bottomfish species and dividing by the number of trips.

Interpretations: The distance between these two lines reflects the relative importance of bottomfish species in the total catch whenever any bottomfish is landed. The relative importance of bottomfish has been declining since 1985, and took a sharp decline in 1989.

Hawaii
1989 Descriptors and Indicators

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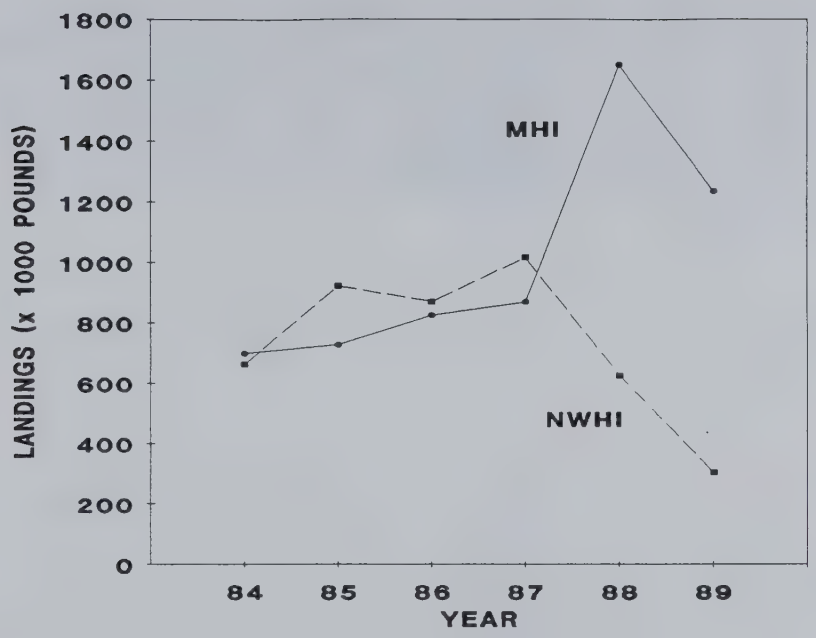
HAWAIIAN BOTTOMFISH LANDINGS, 1984-1989



DATA SOURCE:

Landings data collected by Honolulu Laboratory's market monitoring program.

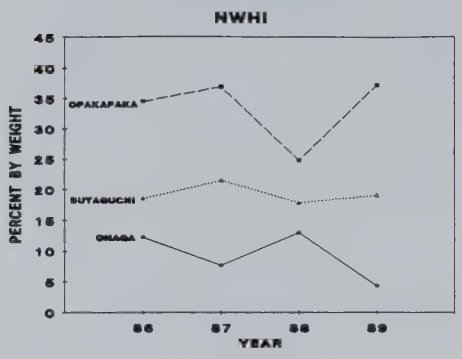
CALCULATIONS & ADJUSTMENTS:

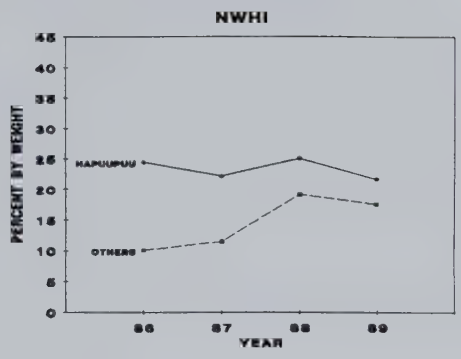
National Marine Fisheries Service data are presented as an expanded estimate to approximate the total market volume represented by our monitoring sites. Market expansion factors are based on a 1979 survey of wholesale markets in Hawaii and on the landing patterns of specific fleets. The expansion factors range from 1 (which indicates that our sample represents the entire market for a particular gear type and species combination) to 2 (which indicates that our sample is half of the total market).

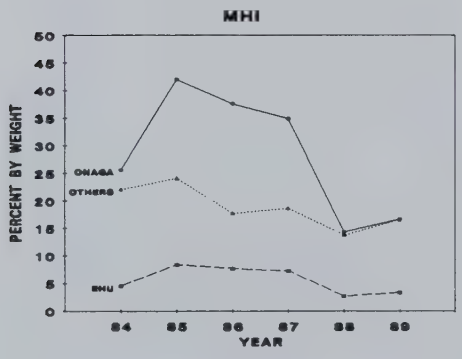
INTERPRETATION:

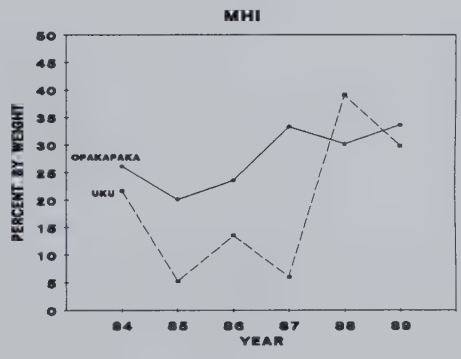
The landings in the NWHI have gone down in the last two years mainly due to the decrease in the number of participating vessels and the corresponding number of trips. The main Hawaiian islands landings have increased dramatically in the same period. This fluctuation was mainly due to the increase in the landings of uku or grey snapper (Aprion virescens). The landings of this fish seems to be cyclical with 1988 being the peak of abundance.

HAWAIIAN BOTTOMFISH CATCH COMPOSITION









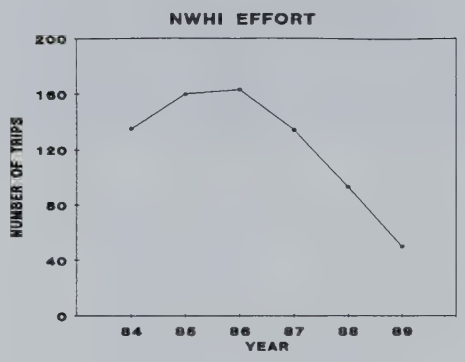
DATA SOURCE:

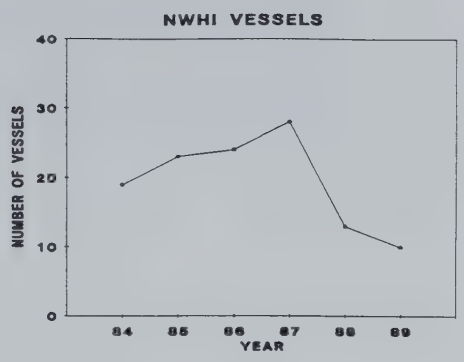
Catch data collected at Honolulu auction by the NMFS market monitoring program.

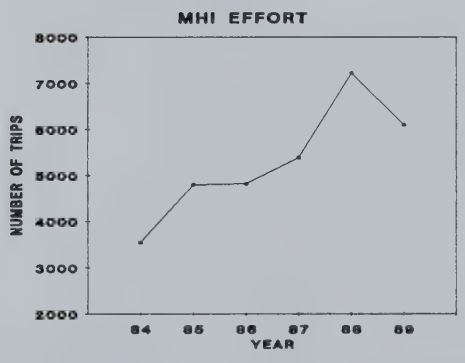
CALCULATIONS & ADJUSTMENTS:

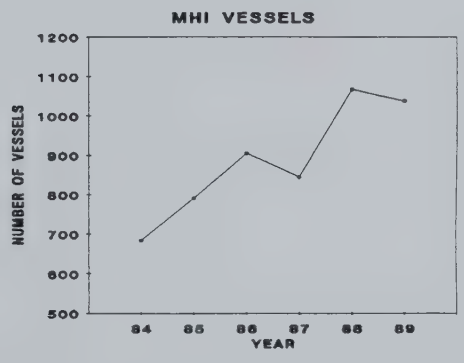
Catch composition is expressed as percent of total bottomfish weight.

FISHING EFFORT AND VESSELS IN HAWAIIAN BOTTOMFISH FLEET









DATA SOURCE:

Fishing effort and vessels based on Honolulu auction data collected by the NMFS market monitoring program.

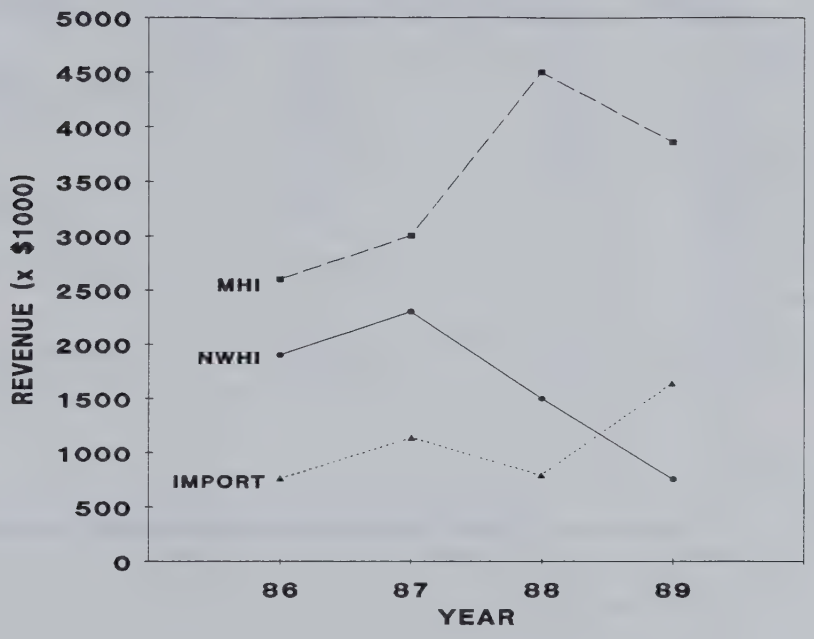
CALCULATIONS & ADJUSTMENTS:

MHI trips and vessels estimated from total adjusted MHI bottomfish landings, mean catch per trip, and mean total landing per year per boat. Trip data were screened to only include trips where at least 90% of the catch by weight was bottomfish.

INTERPRETATION:

MHI effort and participation are generally increasing over this time interval. Both reached peak values in 1988. The NWHI limited entry program started in 1989, eliminating a few possible entrants into that fishery. The reduced number of vessels made essentially the same average number of trips, therefore the total number of trips to the NWHI declined.

HAWAIIAN BOTTOMFISH MARKET REVENUE, 1984-1989



DATA SOURCE:

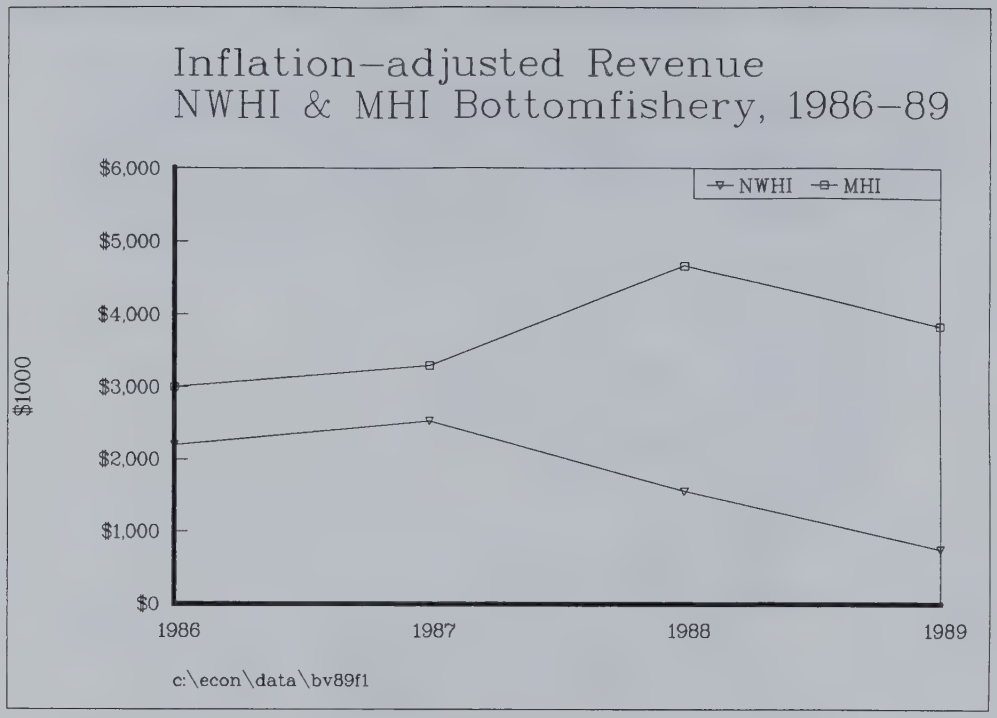
Revenue data collected by Honolulu Laboratory's market monitoring program.

CALCULATIONS & ADJUSTMENTS:

National Marine Fisheries Service data are presented as an expanded estimate to approximate the total market volume represented by our monitoring sites. Market expansion factors are based on a 1979 survey of wholesale markets in Hawaii and on the landing patterns of specific fleets. The expansion factors range from 1 (which indicates that our sample represents the entire market for a particular gear type and species combination) to 2 (which indicates that our sample is half of the total market).

INTERPRETATION:

Revenue follows the same pattern as landings because prices have not fluctuated greatly.



Data Source:
Honolulu market monitoring program, NMFS.

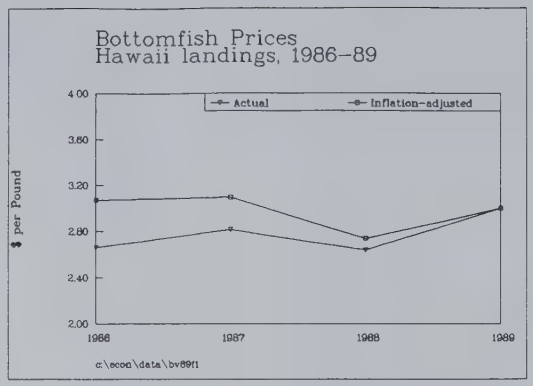
Calculations and Adjustments:
Revenue adjusted to 1989 price levels by the Honolulu consumer price index.

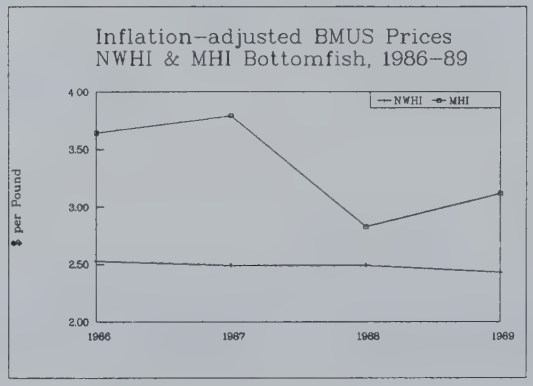
Interpretations:
Despite the dramatic increase in MHI landings and the apparent increase in revenue, adjusting revenue for inflation from 1986-89 shows a lower increase in real (inflation-adjusted) terms.

Table 1
1989 Average Price By Species and Capture Location

Species	Market	NWHI	MHI
Opakapaka	3.58	3.78	3.51
Onaga	4.81	3.23	4.92
Ehu	3.36	1.85	3.71
Hapuupuu	2.86	2.61	3.64
Butaguchi	1.85	1.31	3.16
Other BMUS	2.42	1.20	2.52
Other bottomfish	2.08	1.52	2.16
Imports	2.97		
TOTAL BOTTOMFISH	3.12	2.61	3.26

HAWAIIAN BOTTOMFISH PRICES



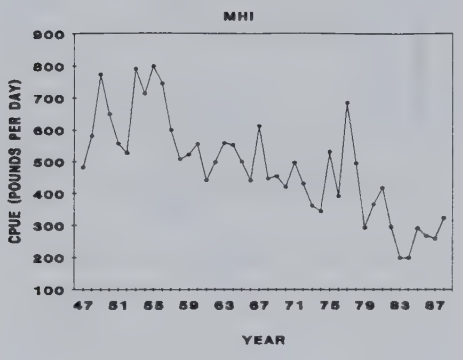


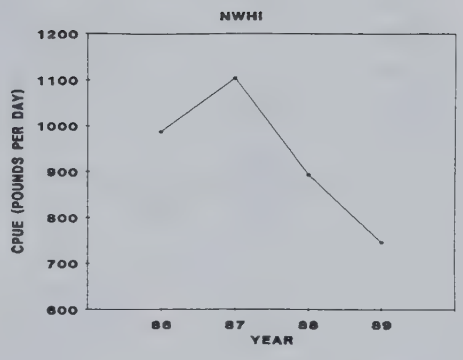
DATA SOURCE:
Honolulu market monitoring program, NMFS

CALCULATIONS & ADJUSTMENTS:
Inflation adjusted prices have been adjusted to 1989 price levels through the Honolulu consumer price index.

INTERPRETATIONS:
MHI prices have fallen in the past two years due to substantially increased landings. NWHI prices are extremely stable.

CPUE FOR HAWAIIAN BOTTOMFISH





DATA SOURCE:

Main Hawaiian Island (MHI) CPUE is based on data reported to HDAR by commercial fishermen. Northwestern Hawaiian Island (NWHI) CPUE is based on Honolulu auction data and vessel interview data collected by the NMFS market monitoring program.

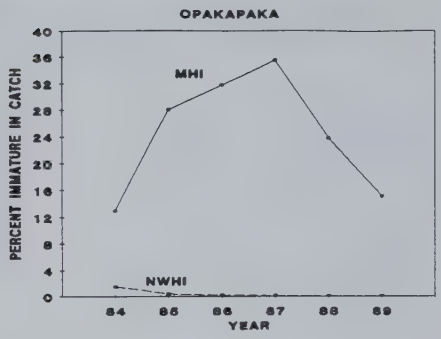
CALCULATIONS & ADJUSTMENTS:

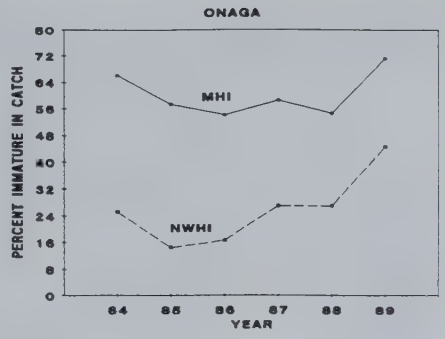
MHI and NWHI trips were screened to only include trips where at least 90% of the catch by weight was bottomfish. Additionally, MHI small boats were excluded by the following method: Each vessel was ranked according to its maximum landing for a given year. The top ten vessels' maximum landings were averaged and only vessels whose maximum catch that year was equal to or greater than 30 percent of the mean of the top ten boats were included. NWHI effort (fishing days per trip) was averaged and applied to all trips landing at least 1000 pounds of bottomfish (i.e. "effective trips" of Ralston and Kawamoto (1988)).

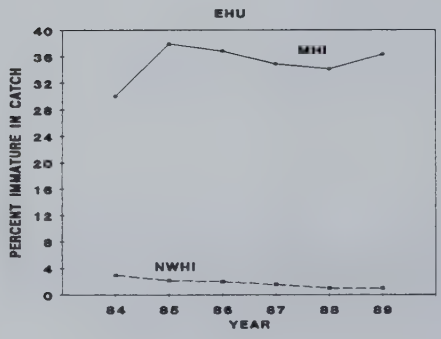
INTERPRETATION:

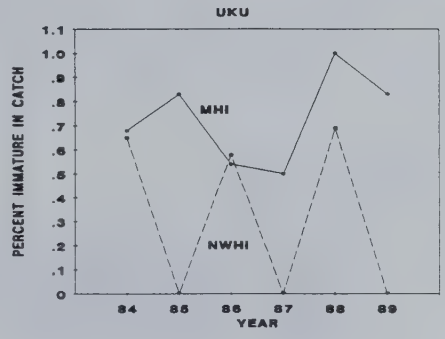
The general trend in MHI CPUE is decreasing, with current values approximately half that of initial. NWHI CPUE is steadily decreasing since 1987.

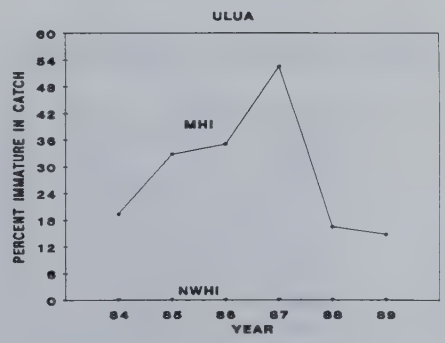
PERCENT IMMATURE IN HAWAIIAN BOTTOMFISH CATCH











DATA SOURCE:

Catch data obtained from Honolulu auction by NMFS personnel. Size at maturity from Everson (1983), Everson et. al. (in press), Kikkawa (1983), Sudekum (1984).

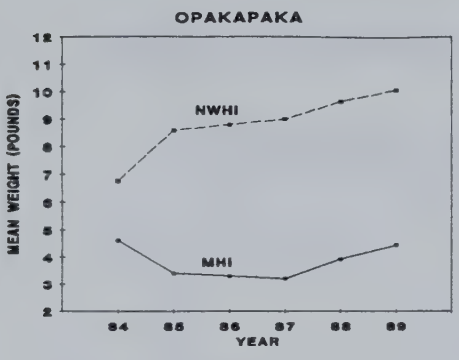
CALCULATION AND ADJUSTMENTS:

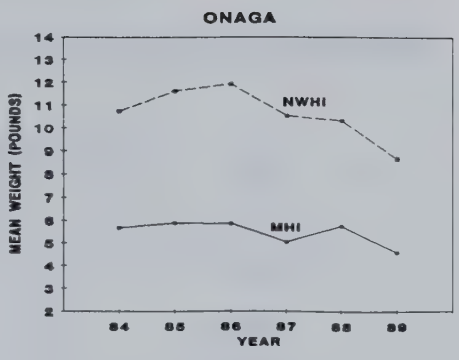
Maturity was assumed to be "knife-edge", and all fish in the same lot were assumed to be of equal size. The percent immature is calculated in terms of weight.

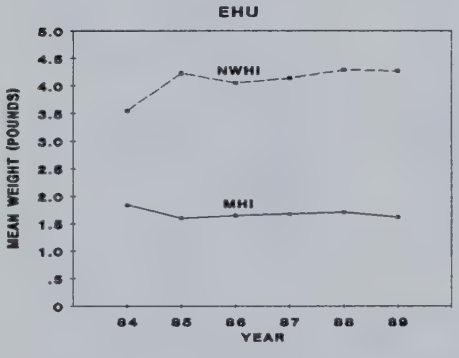
INTERPRETATION:

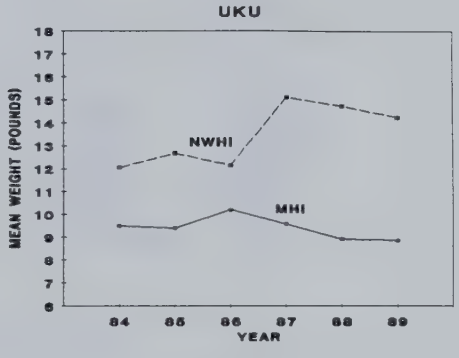
MHI catch is comprised of more immature fish than NWHI catch. MHI onaga catch has the highest percentage of immature fish, and is the only one consistently over fifty percent, suggesting a "yellow light" condition.

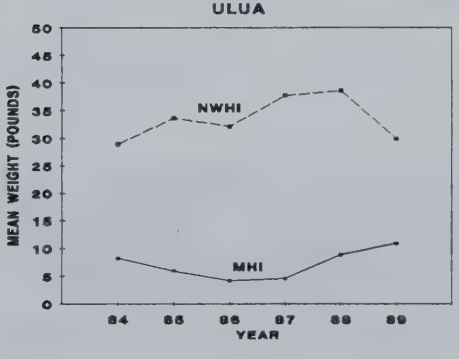
MEAN WEIGHT OF HAWAIIAN BOTTOMFISH

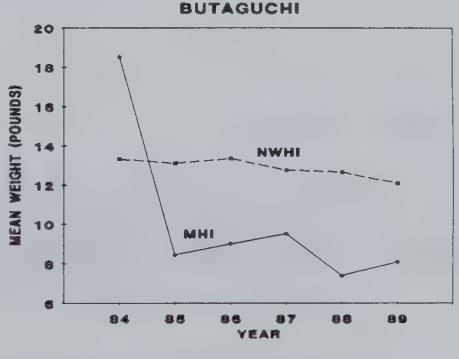


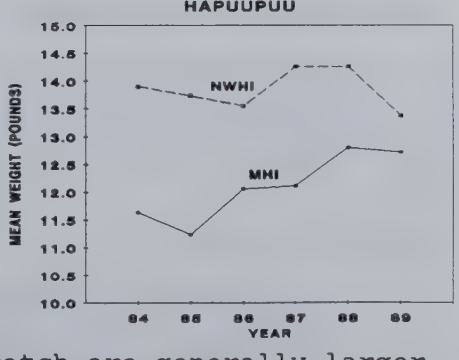












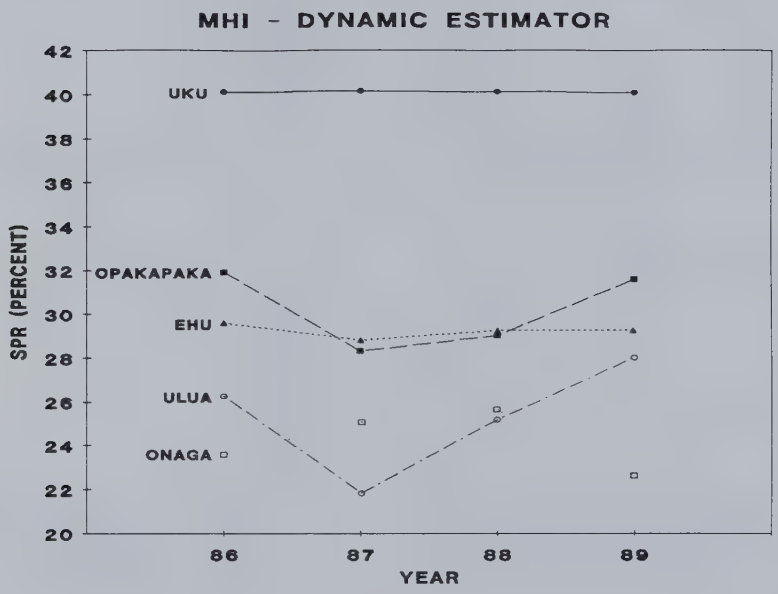
DATA SOURCE:

Fish size is obtained from catch data collected at Honolulu auction by NMFS personnel.

INTERPRETATION:

Mean weights of fish in NWHI catch are generally larger than those in MHI catch.

SPAWNING POTENTIAL RATIO (SPR) FOR HAWAIIAN BOTTOMFISH



DATA SOURCE:

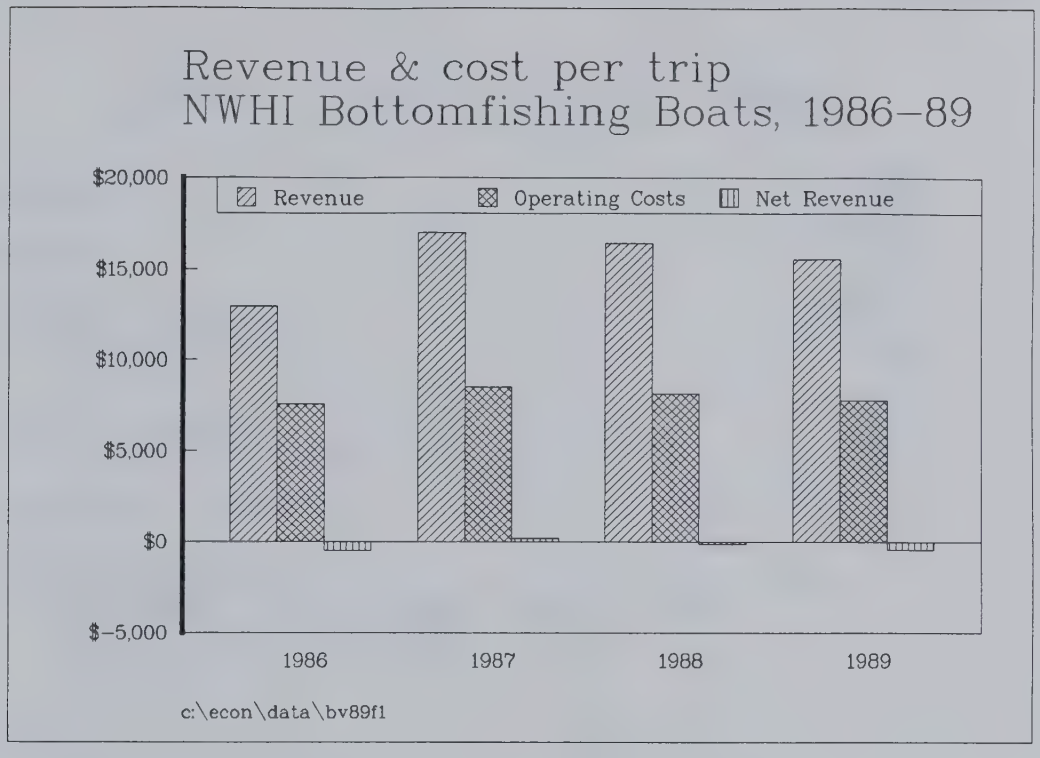
SPR estimated from Honolulu auction size frequency data collected by NMFS personnel and CPUE estimates from data reported to HDAR by commercial fishermen. Additional information for opakapaka obtained from size frequency data of fish caught from the R.V. Townsend Cromwell.

CALCULATION & ADJUSTMENTS:

Calculations use same methodology as presented in Somerton and Kobayashi (in prep.). Virgin CPUE estimate is 1947-1951 mean; current CPUE estimate is 1986-1988 mean.

INTERPRETATION:

SPR estimates of these five species are above the twenty percent "critical" level used as an indicator of overfishing. This suggests that these species in the MHI are currently **not** overfished.



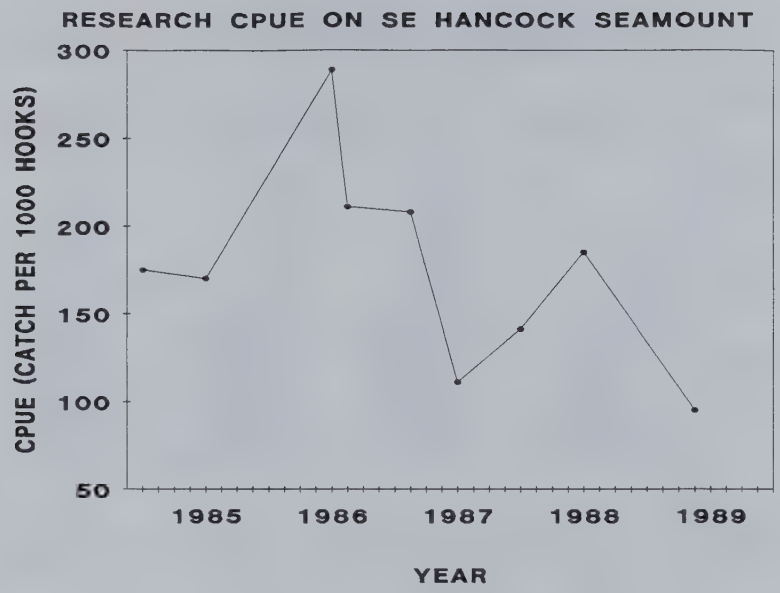
Data Source:

Pooley and Kawamoto (1990) -- Sample of NWHI bottomfishing vessel cost and revenue

Calculations and Adjustments:

Interpretations:

Despite a decline in the number of active NWHI bottomfishing vessels, individual vessel operations have remained quite stable. Since catch rates have not rebounded with the diminished effort by the fleet, profitability (net revenue) remains neglible.



DATA SOURCE:

CPUE is based on longline catches at Southeast Hancock Seamount by NMFS personnel aboard the R.V. Townsend Cromwell. There have been nine stock assessment cruises since 1985.

CALCULATIONS & ADJUSTMENTS:

Fishing gear and sampling methods are described in Somerton (1988) and Somerton and Kikkawa (in prep.). CPUE is a depth stratified average.

INTERPRETATION:

Fluctuations in CPUE apparently represent episodic recruitment followed by high natural mortality since there is no commercial fishing at Southeast Hancock Seamount.

Guam
1989 Descriptors and Indicators

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Number of Trips, Boat Hours	G-4
Participation Information	Not available
Economic Information	
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Aggregate Average Price	G-7
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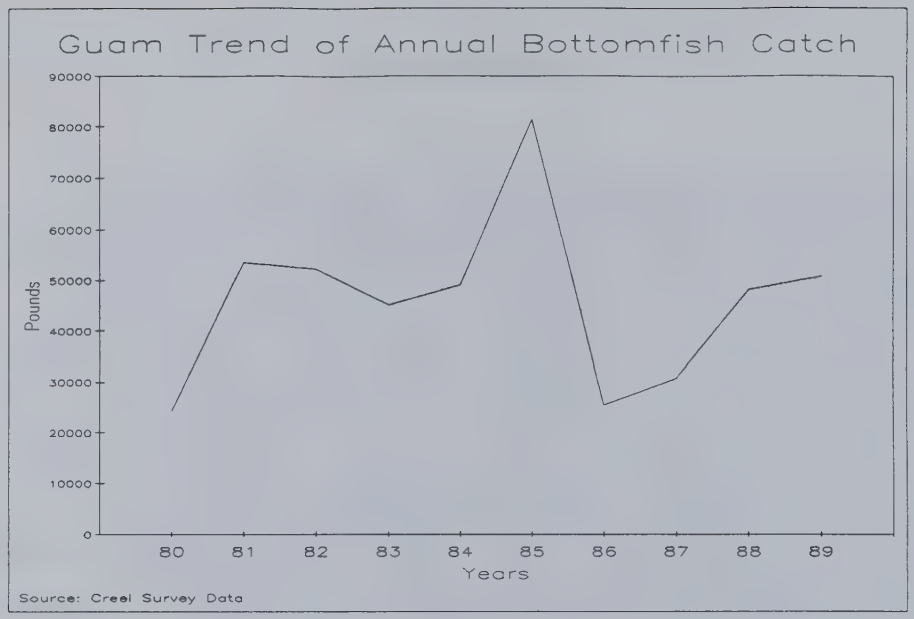
Aggregate CPUE	G-8
Percent Catch Immature	Not Available
Mean Size by Species	G-9
Spawning Potential Ratio	Not Available
Revenue Per Trip	G-11

Introduction

Guam's bottomfish fishery is a combination small scale local commercial and subsistence fishery. The majority of the participants are part-time fishermen who operate vessels less than 25 feet in length. Through the history of this fishery, fluctuations in annual harvest have been magnified by the consistent turnover in the few full-time highliner vessels. These vessels tend to be larger, represent a large percentage of the effort expended in the fishery and impact the total annual harvest significantly. Guam has two relatively distinct bottomfish fisheries which can be separated by depth and species. The shallow water fishery (100-500 ft.) contributes a larger portion of the overall bottomfish harvest. This fishery targets the red-gilled emperor (Lethrinus rubrioperculatus), also catching an assemblage of other snappers and groupers. The deep water fishery concentrates on the Pristipomoides snapper complex, focusing on depths between 500-700 feet. Although Guam's bottomfish fishery has limited economic importance, the social importance carries strong cultural and subsistence values.



Source: The DAWR offshore creel survey data as expanded by computer based algorithms by method of fishing.

Calculations: Generally speaking, the estimated total landings of the bottomfish species are selected from the creel survey expanded species composition files. However, the expanded estimates of catch by species must include at least a portion of the catch identified only by generic species codes categories. These generic categories (e.g. mixed shallow bottomfish) also include some non-bottomfish species according to the FMP definition (e.g. squirrelfish). Therefore, a portion of these are factored out based on percent species composition of the identified catch.

Interpretations: The fairly radical fluctuations in the bottomfish landings are due primarily to fluctuations in the fishery, not the fish stocks. The 1985 peak and 1986 crash are primarily due to a few highliner fishermen who fished in 1985 and not in 1986.

Table 1

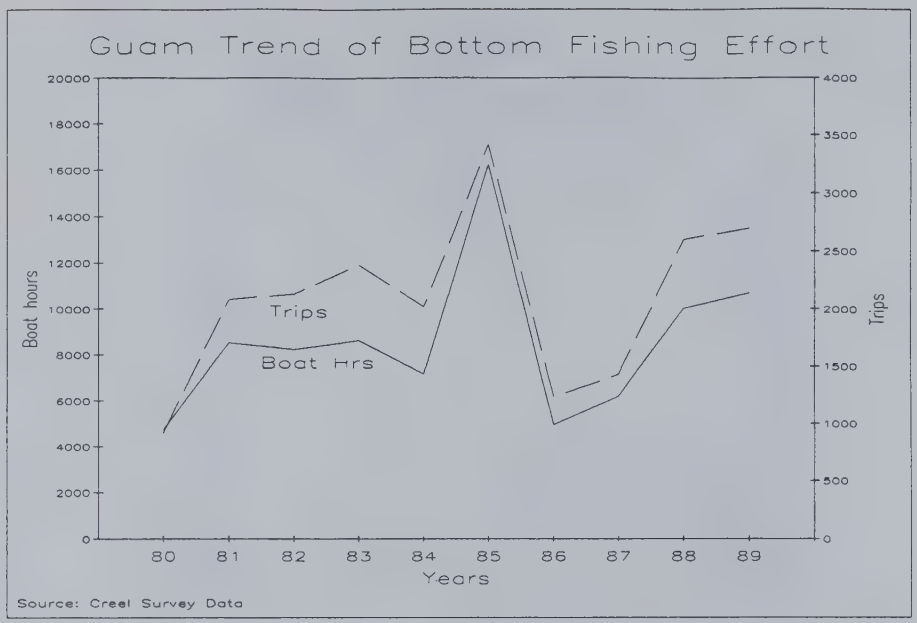
Guam 1989 Creel Survey Species Composition of Bottomfish

Species	Pounds
Grouper	3962
Jacks	8334
Snapper	2692
Lehi	1607
Uku	5023
Ehu	1321
Onaga	643
Taape	1276
Yellowtail Kalekale	6645
Opakapaka	1129
Yelloweye Opakapaka	1021
Kalekale	82
Gindai	3040
Emperor	13988
Total bottomfish	50763

Table 2

Guam 1989 Commercial Landed Bottomfish Average Price

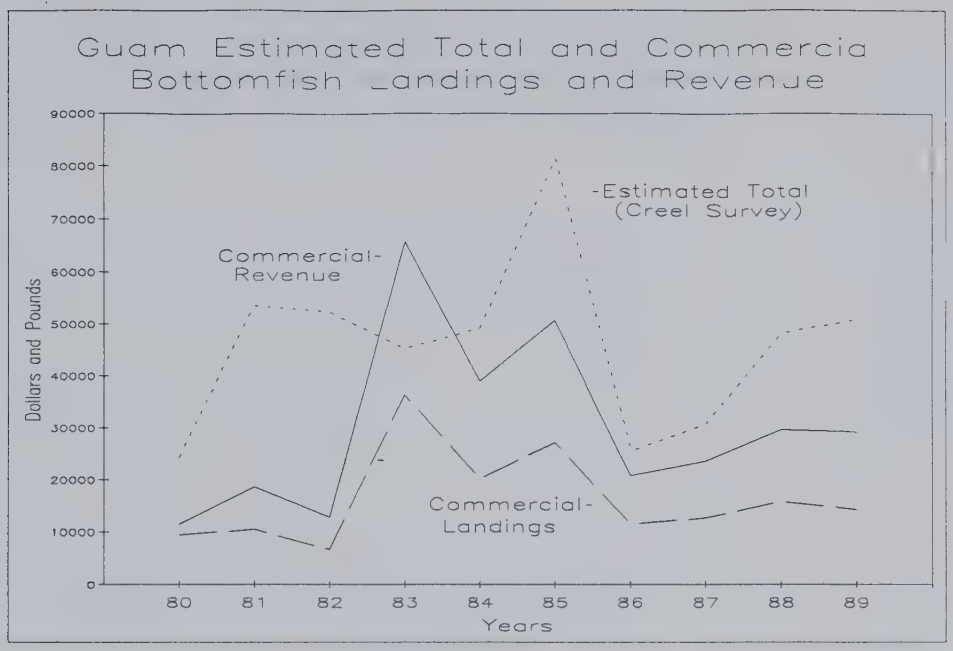
Species	Avg. $/Lb
Jacks	1.44
Bottomfish	2.21
Ehu (red snapper)	2.23
Gindai (flower snapper)	2.50
Grouper	1.00
Kalekale (pink snapper)	2.14
Onaga (red snapper)	3.00
Opakapaka (pink snapper)	2.63
Uku (gray snapper)	1.51
Emperor (mafute)	2.24
All bottomfish species	2.04



Source: The DAWR creel survey data for the method bottom fishing.

Calculations: The estimated number of boat trips and boat hours for the bottom fishing method are derived directly from the creel survey expansion algorithms.

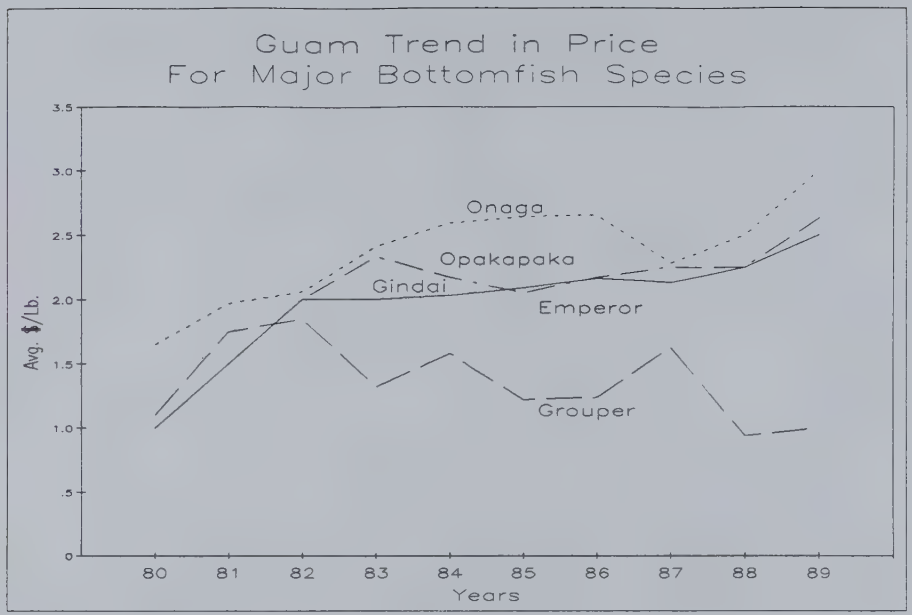
Interpretations: These two measures of effort nearly mirror each other and the previous figure for catch.



Source: The estimated total landings are from the DAWR creel survey system, and the commercial data are from the WPACFIN originated commercial landings system.

Calculations: The creel survey data are the same as in the first figure. The total commercial landings and revenue for each year were calculated by summing the weight and value fields in the commercial landings data base and then multiplying by an estimated percent coverage expansion factor. This annual expansion factor was subjectively created based on as many factors as possible depending on the year, including: an analysis of the "disposition of catch" data available from the DAWR offshore creel survey; an evaluation of the fishermen in the fishery and their entry/exit patterns; general "dock side" knowledge of the fishery and the status of marketing conditions and structure; the overall number of records in the data base; and a measure of best educated guess.

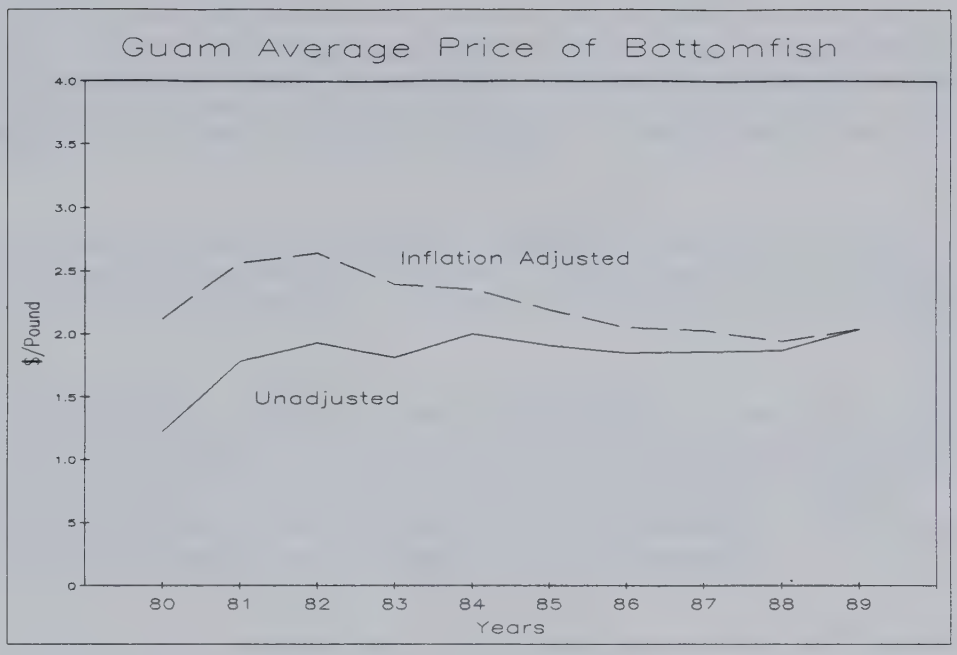
Interpretations: The major fluctuations in the bottomfish fishery are believed to be fishery based, not stock based.



Source: The commercial landings data from the major wholesaler.

Calculations: The total revenue for a given species is divided by the total sold weight of that species to give the annual average price per pound.

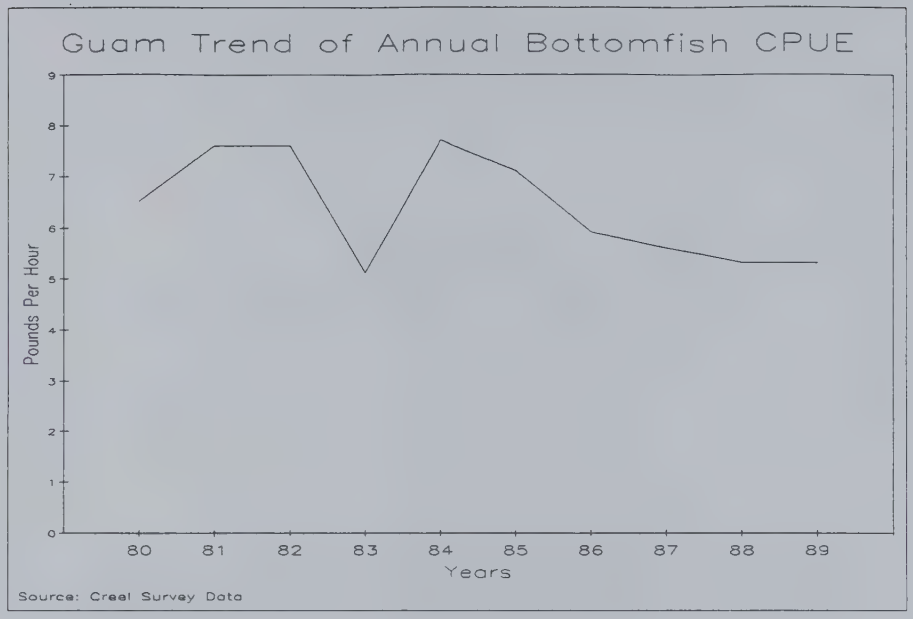
Interpretations: The average price of most species have been fairly stable for most of the time series and most went up somewhat in 1989. The exception is grouper which seems to be having a downward trend, possibly because the size typically being sold is small.



Source: The commercial landings data from the major wholesaler.

Calculations: The average price of all bottomfish species combined is calculated by dividing the total bottomfish revenue by the sold weight. The inflation adjustment is made by using the Consumer Price Index (CPI) for Guam and establishing the 1989 figure as the base from which to calculate expansion factors for all previous years (e.g. divide the 1989 CPI by the CPI for any given year), and then multiplying that factor by the unadjusted average price to obtain the adjusted average price for the given year. The CPI for Guam was not available for 1989, so the relative Hawaii CPI was used to create one for Guam.

Interpretations: The unadjusted average price indicates a fairly stable price structure, but the inflation adjusted figure shows a slowly deteriorating price situation.



Source: The DAWR creel survey data for the bottom fishing method.

Calculations: The catch per hour for each bottom fishing trip surveyed is treated as a separate observation in calculating the average CPUE for the bottom fishing method. Basically, the sum of the individual trip CPUEs for surveyed trips is divided by the total number of surveyed trips.

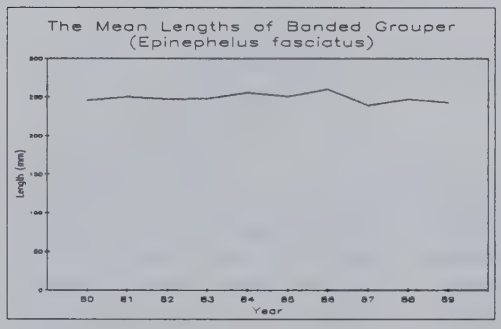
Interpretations: The annual CPUE fluctuates between 5 and 8 pounds per hour, but has been fairly stable for the past 4 years. No problems are indicated by the CPUE.

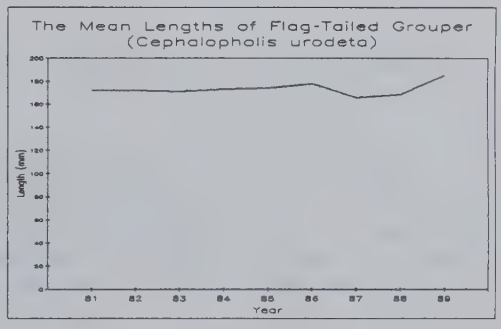
The following comments are for the next eleven figures.

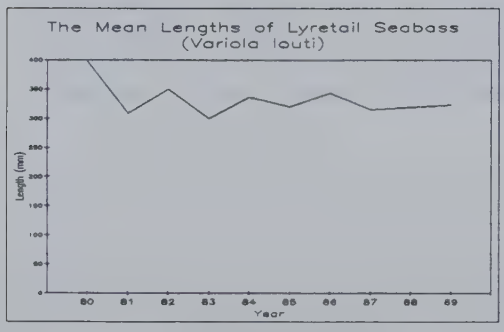
Source: All of the data for the following mean length plots for eleven of the important bottomfish species for which data are available have come from the DAWR creel sampling program. When fishermen are interviewed, their catch is measured whenever possible.

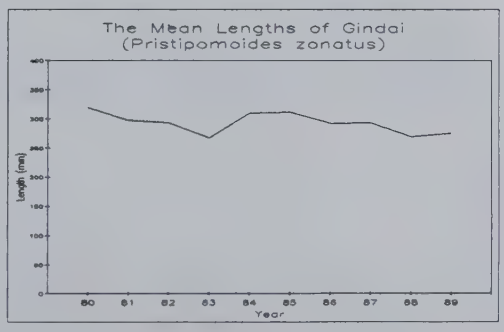
Calculations: For each year the number of samples for any given species may vary greatly. The mean length was calculated by summing the length for all individuals measured and dividing by the number of individuals.

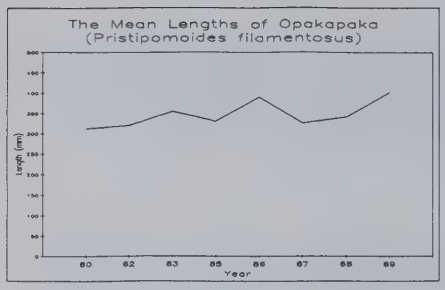
Interpretations: Although sample sizes may not be large, the data available do not show any indications in declining mean size of any of the species. Therefore, based on mean size alone, there appears to be no problem with the bottomfish fishery. However, analyses of other indicators are needed to be certain that there indeed is no problem with the fishery.

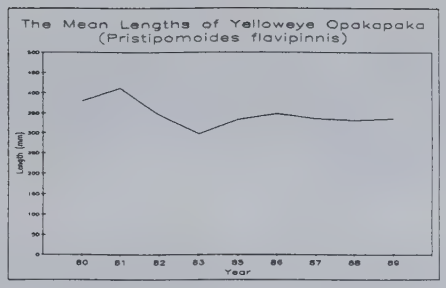


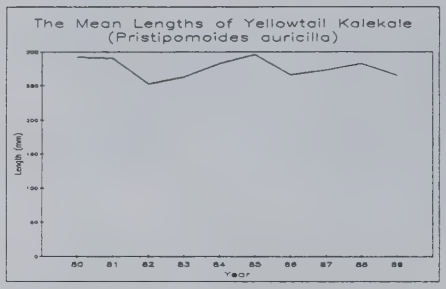


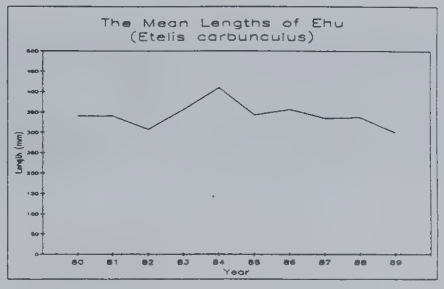


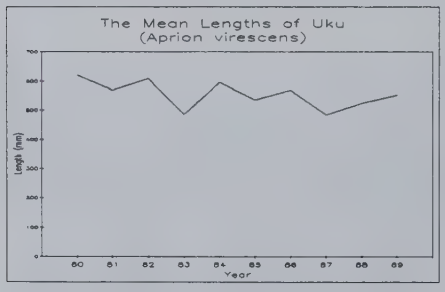


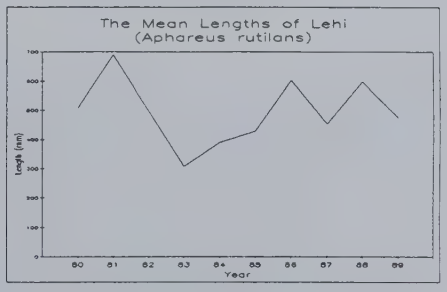

The Mean Lengths of Opakapaka
(Pristipomoides filamentosus)
Length (mm)
Year

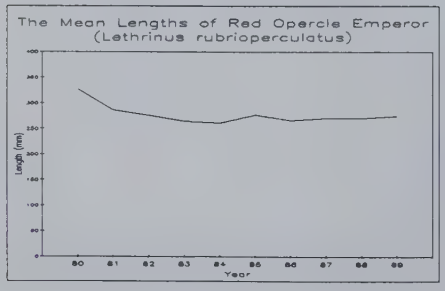

The Mean Lengths of Yelloweye Opakapaka
(Pristipomoides flavipinnis)
Length (mm)
Year

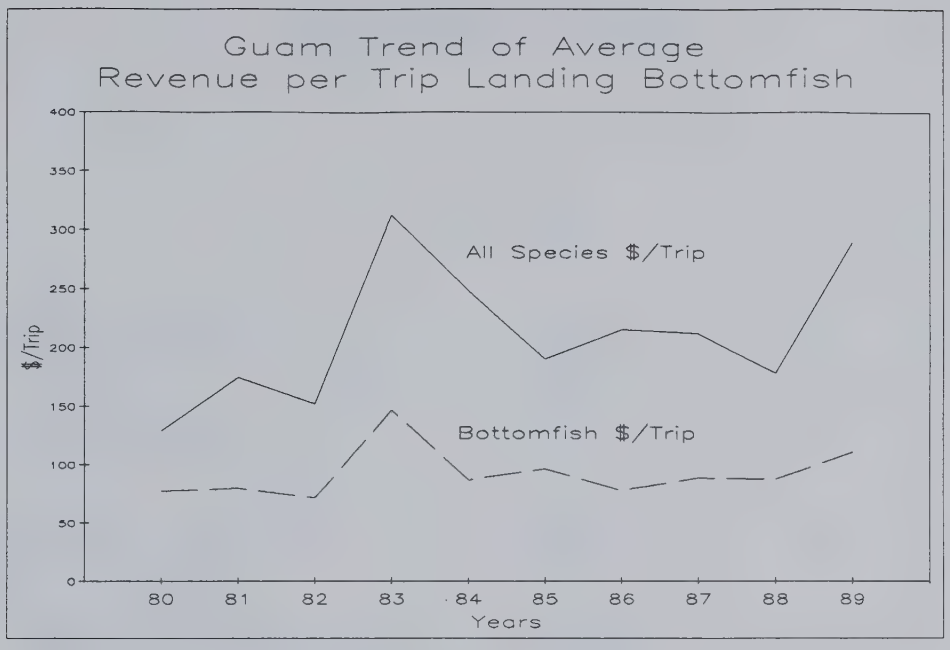

The Mean Lengths of Yellowtail Kalekale
(Pristipomoides auricilla)
Length (mm)
Year


The Mean Lengths of Ehu
(Etelis carbunculus)
Length (mm)
Year


The Mean Lengths of Uku
(Aprion virescens)
Length (mm)
Year


The Mean Lengths of Lehi
(Aphareus rutilans)
Length (mm)
Year


The Mean Lengths of Red Opercle Emperor
(Lethrinus rubrioperculatus)
Length (mm)
Year



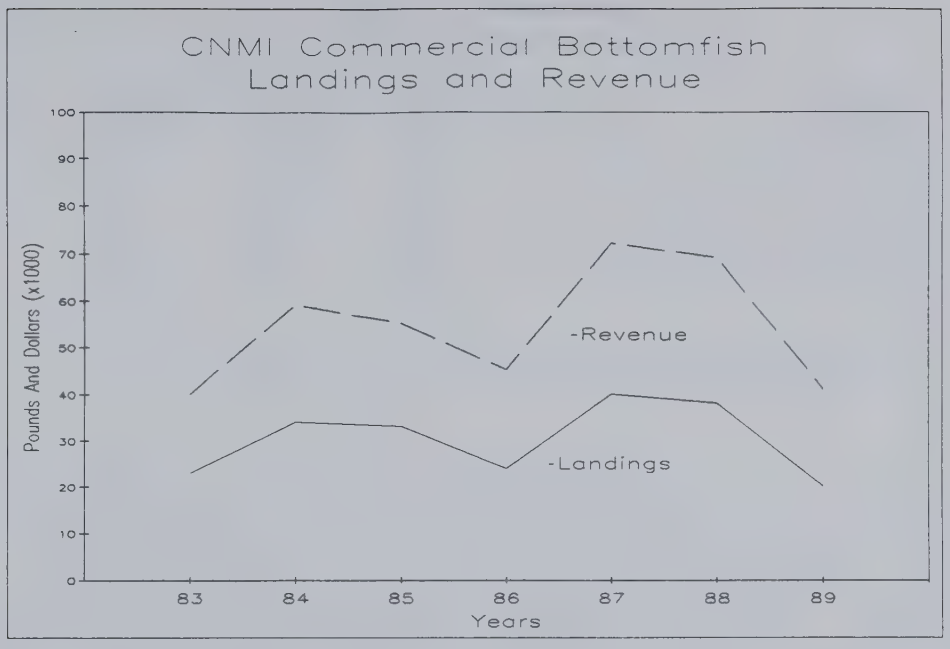
Source: The commercial landings data from the major wholesaler, the Guam Fisherman's Coop.

Calculations: The average revenue per trip for all species is calculated by summing the revenue of all species sold for any trip which landed bottomfish species, and dividing by the number of trips. The average bottomfish revenue per trip is calculated from those same trips by summing the sales of only bottomfish species and dividing by the number of trips.

Interpretations: The further these lines are apart, the less important the bottomfish species are in the total revenue of a trip which landed and sold bottomfish. Clearly, when bottomfish are landed, they only comprise about half, or less, of the catch for the trip. Most bottomfishing trips, especially those to the offshore banks areas, include a considerable amount of trolling.

Northern Marianas Islands
1989 Descriptors and Indicators

	Page
Descriptors	
Landings Information	
Aggregate Catch	CNMI-1
1989 Landings By Species	CNMI-2
Effort Information	
Number of Trips, Boat Hours	CNMI-5
Participation Information	
Number of Boats	CNMI-6
Economic Information	
Aggregate Revenue	CNMI-1
1989 Average Price By Species	CNMI-2
1989 Revenue By Species	CNMI-2
Price Trends for Major Species	CNMI-3
Aggregate Average Price	CNMI-4
Indicators	
Aggregate CPUE	CNMI-7
Percent Catch Immature	Not Available
Mean Size by Species	Not Available
Spawning Potential Ratio	Not Available
Revenue Per Trip	CNMI-8

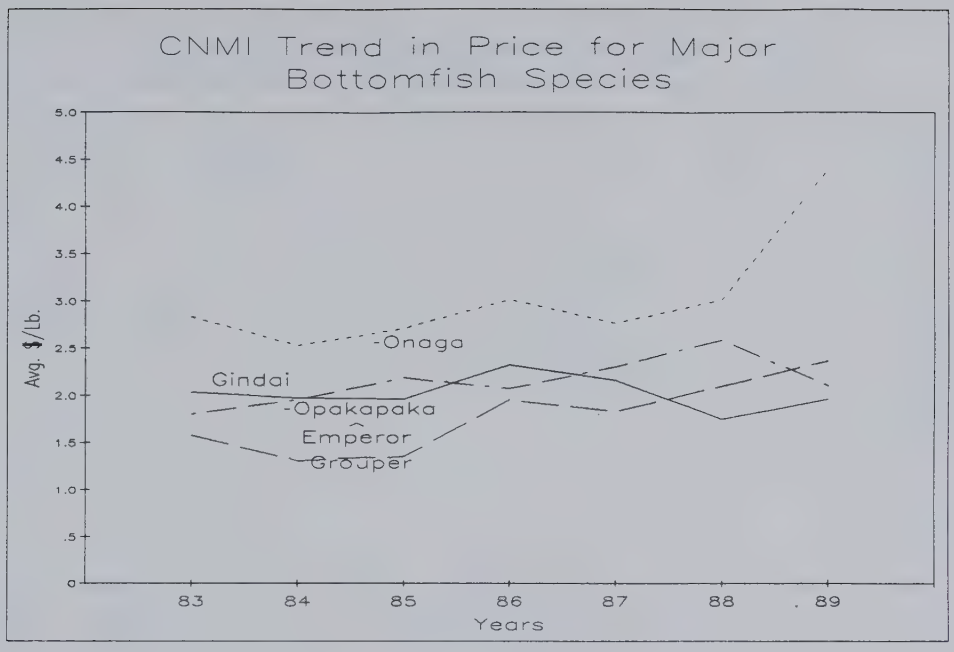


Calculations: Landings in pounds is from a simple data base summation of reported purchases of all bottomfish species combined. Revenue in dollars is from the same type of data base summation of the value field.

CNMI 1989 Commercial Landings
of Bottomfish Species

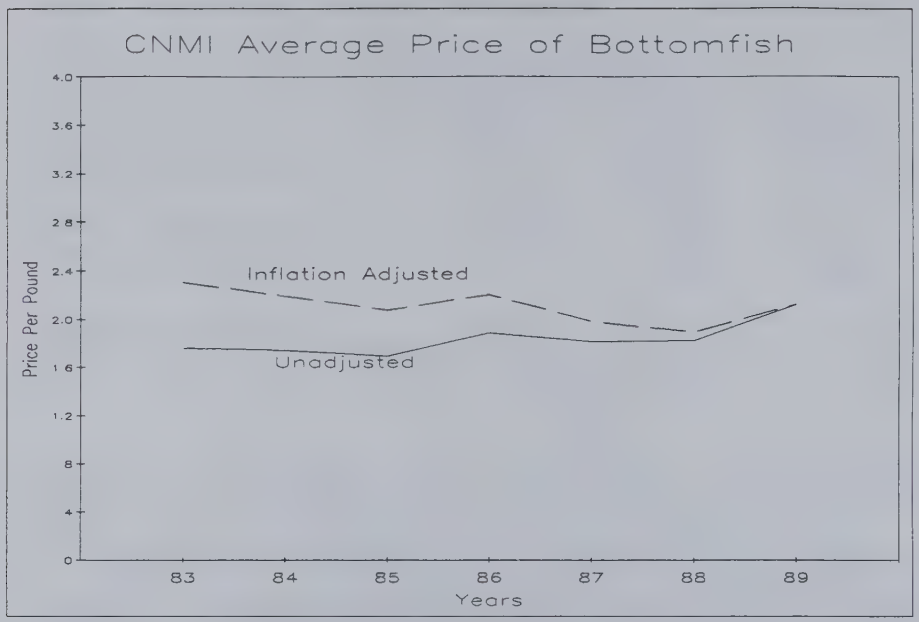
Species	Pounds	Revenue	$/Lb.
Bottomfish	12713	23100	1.82
Gindai (flower snap)	805	1579	1.96
Grouper	450	1060	2.36
Onaga (red snapper)	1982	8710	4.39
Opakapaka (pink snap)	430	902	2.10
Emperor (mafute)	3170	6028	1.90
Bottomfish Total:	19550	41379	2.12

The CNMI Commercial Landings System is based on completion and submission of "trip ticket" invoices by first-level purchasers of fresh fish. This includes fish wholesalers, fish markets, stores, restaurants, hotels, and even roadside fish mobiles. Staff of the Division of Fish and Wildlife routinely contact each known vendor to collect completed forms and distribute additional invoice books. Although this data collection system has been in operation since the mid-1970's, only data collected since 1983 are considered accurate enough to be comparable for most aspects of the fisheries. No actual fishing effort or location data are available within this system. Effort must be calculated based on a trip basis.



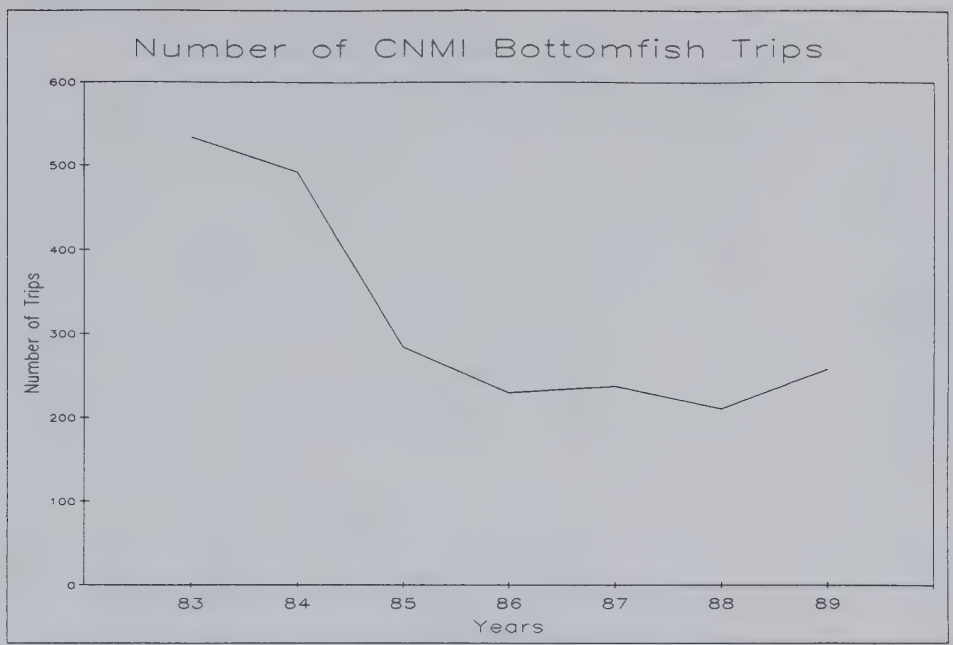
Calculations: The average price for each of these important bottomfish species is calculated by dividing the total revenue by the total weight landed for each species.

Interpretations: The prices have remained fairly constant over time, with onaga always drawing the highest price and making a substantial jump in 1989, probably due to sales to "white tablecloth" restaurants.



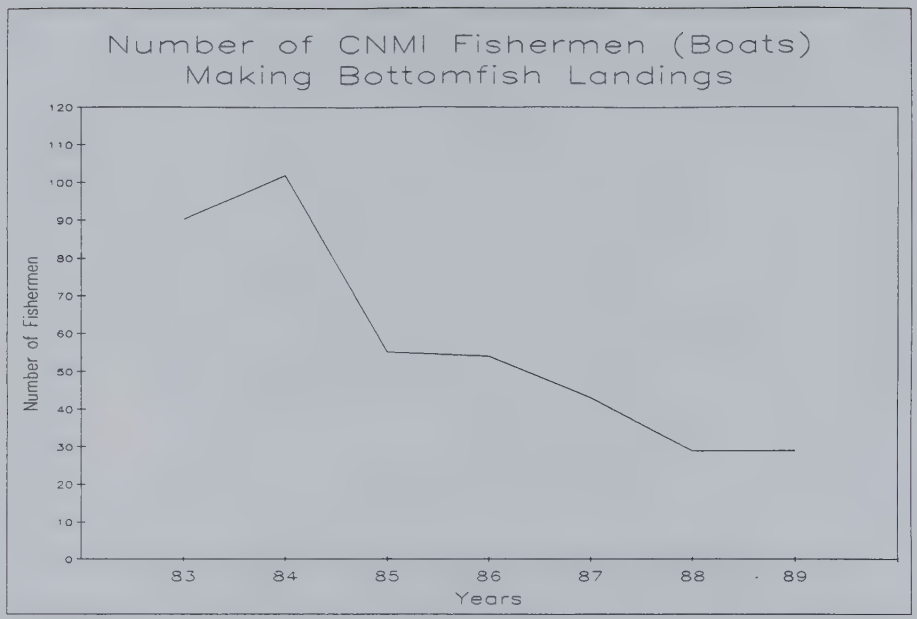
Calculations: The average price of the bottomfish complex is calculated by dividing the total revenue by the total landings. The adjustment for inflation is made by using the Consumer Price Index (CPI) for the CNMI and establishing the 1989 figure as the base from which to calculate expansion factors for all previous years (e.g. divide the 1989 CPI by the CPI for any other year) and then multiplying that factor by the unadjusted average price to obtain the adjusted average price for the given year. Data were not available for 1988 and 1989, therefore estimated CPIs were created by using Guam's 1988 figure and Hawaii's 1989 figure (Guam's 1989 figure was also not available and was likewise estimated by using Hawaii's).

Interpretations: The inflation adjusted average price has generally been decreasing over the entire time series, whereas the unadjusted average price has generally been increasing. The 1989 upturn in both figures is mostly due to the high price obtained for onaga during the year.



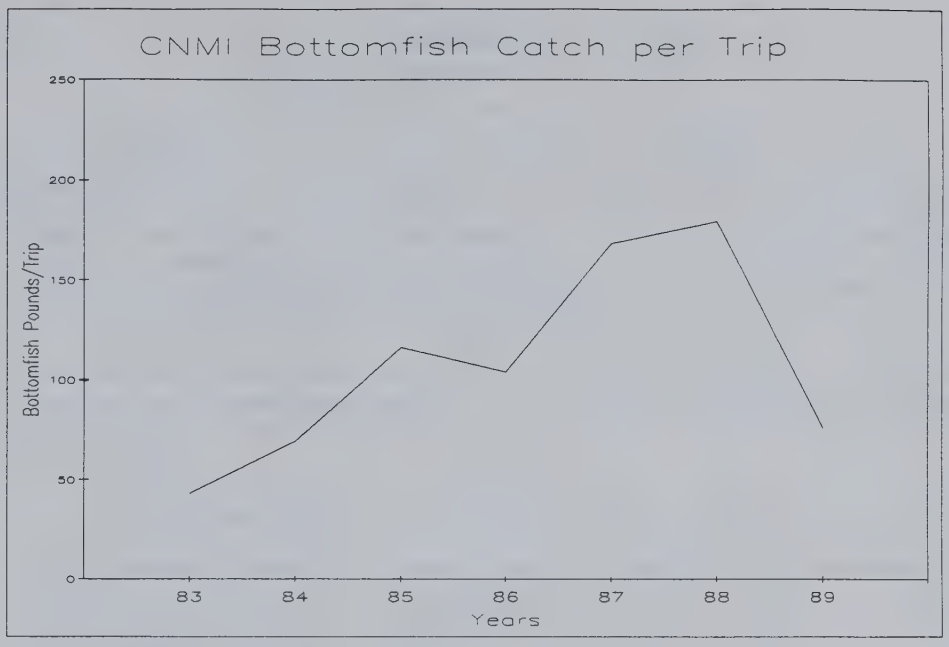
Calculations: The number of trips which resulted in landing any amount of any bottomfish species are tallied by adding each recorded fisherman's trip on a given day. The assumptions are that each fisherman lands only once in any given day, and that he sells all of his catch on that day. Most trips are single day trips, but it is known that some longer trips do occur.

Interpretations: An obvious decrease has occurred in the number of bottomfishing trips being taken by the CNMI fleet, however this is not a result of changes in the bottomfish stocks, but rather the fishery.



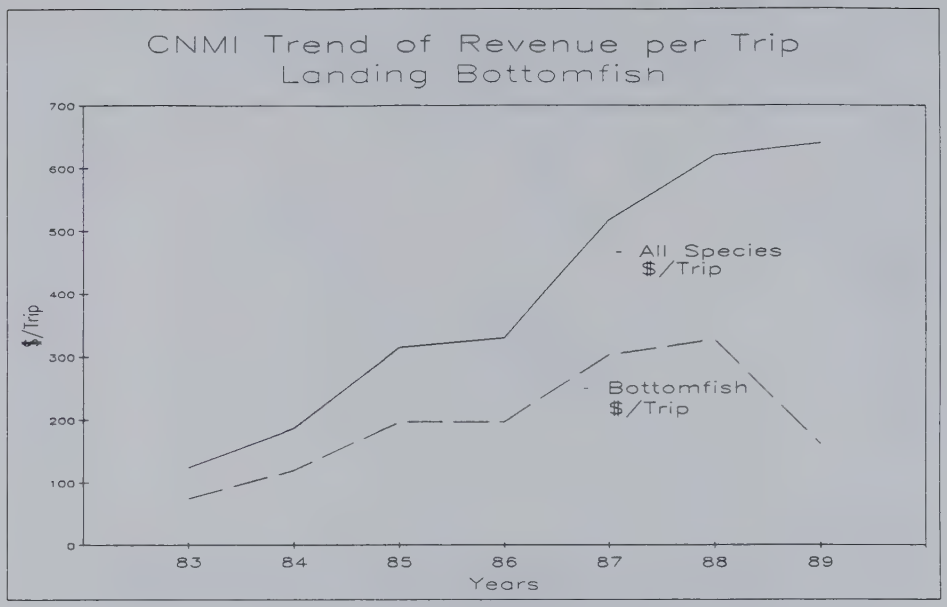
Calculations: The fisherman or boat selling the catch is identified on the "trip ticket" invoices used by purchasers. The plot shows the number of unique fishermen making any landings of bottomfish within a given year.

Interpretations: As with the number of trips, the number of boats or fishermen making commercial landings of any bottomfish species has declined continuously since 1984. The interest in bottomfishing seems to be declining in the CNMI.



Calculations: The average catch per trip is calculated by dividing the total weight of all bottomfish landings by the number of trips which landed bottomfish, regardless of the amount of bottomfish landed on any given trip.
Although the average catch per trip is not a very good measure of CPUE because it is subject to significant biases (e.g. changes in trip length and relative amounts of bottomfishing compared to trolling), it is the only measure readily possible from the commercial landings system. It may be possible to improve this measure of CPUE by using only those trips which landed bottomfish species exclusively, but that has not been done yet. It is believed that the sample size resulting from this exercise would be extremely small and subject to other biases, however, it should be investigated in the future.

Interpretations: The general increase in the average up to 1988 may be a result of a few boats making increased numbers of multiple day trips. The 1989 sudden decrease is also influence by these same boats, as they began making considerably shorter trips. Additionally, the relative proportion (bottomfish vs. pelagics) of bottomfish landed on a trip also declined sharply in 1989 (see next figure).



Calculations: Only trips which landed any bottomfish species are included in these calculations. The "Bottomfish $/Trip" is the total revenue of the bottomfish species sold from a trip, and the "All Species $/Trip" is the total trip revenue all species combined (e.g. including any pelagics and reef fish which were sold).

Interpretations: The relative distance between the lines has grown over the years until in 1989 there was a very sharp divergence. This means that when bottomfish species are landed, they comprise an ever decreasing portion of the total landings from the fishing trip. The bottomfish fishery has always been a small fraction of the total fisheries, and it is becoming even less important.

Appendix 1
Habitat Conditions and Recent Alterations

Under the Fishery Management Plan (FMP), regulations were implemented to prohibit the use of bottom trawls, bottom-set nets, explosives and poisons for harvesting bottomfish. This has served to greatly reduce the potential for bottomfish habitat degradation. To our knowledge, there have been no violations of these regulations in 1989. In addition, 1989 was the first year for implementation of the limited entry program which further reduced potential for bottomfish habitat damage.

As reported in the 1988 annual report, there are several activities occurring or reportedly occurring in the FCZ which potentially may alter bottomfish habitat. These include:

1. Anchor damage by vessels attempting to maintain position over productive bottomfish habitat.

2. Habitat damage from heavy weights and line entanglements during normal hook-and-line bottomfish operations.

3. Habitat damage by illegal foreign fishing activities for precious corals using coral dredges.

An activity which potential may impact bottomfish habitat is a proposal to lease 26,910 square kilometers of the EEZ surrounding the Hawaiian Archipelago and Johnson Island for mining of cobalt rich manganese crusts. A joint State-Federal Task Force, which includes a staff member for the NMFS Habitat Conservation Program, has developed an environmental impact statement (EIS) for the proposed activity. The Draft EIS, "Proposed Marine Mineral Lease Sale in the Hawaiian Archipelago and Johnson Island Exclusive Economic Zones", has been published. the Final EIS will be published in June 1990.

The potential threat to bottomfish habitat now is being reviewed through the Council's Ecosystems and Habitat Committee. The Council has adopted a Habitat policy which will assure that each fishery management plan includes all available information on habitat significant to the species to be managed.

Appendix 2
NMFS Administrative Actions

The principal administrative actions for the NMFS was to implement the Northwestern Hawaiian Islands limited entry program, which became effective January 1, 1989. (See report on the Northwestern Hawaiian Islands Bottomfish Limited Entry Program, Appendix 3).

In response to Council's request, the NMFS (Southwest Region) prepared an amendment to regulations governing the western Pacific bottomfish and seamount groundfish fisheries (50 CFR 683) making it a federal requirement that all catches of bottomfish management unit species by domestic fishermen be reported to the appropriate state (territorial) agency in compliance with state/territorial laws and regulation. Current federal regulations require only NWHI fishermen to report their bottomfish catches to the State of Hawaii. The intent of the regulatory amendment is to apply the reporting requirement to American Samoa, Guam, main Hawaiian Islands bottomfish fisheries that are covered by the bottomfish FMP to ensure that all landings of bottomfish are reported in a timely accurate manner. The proposed amendment was submitted to NOAA's Assistant Administrator for Fisheries in March 1990.

Appendix 3
Report on the Northerwestern Hawaiian Islands (NWHI) Bottomfish Limited Entry Program

Introduction

The NWHI limited entry program calls for a year-end evaluation of the program after the first year of implementation. This report provides a description of the activity in the fishery and in the administration of the program, presents a brief economic assessment, and discusses some issues of concern encountered during the first year of the program.

I. Administrative Actions - Permits

In 1989, the NMFS Southwest Region (Pacific Area Office) issued a total of 20 permits to fishing vessels participating in the NWHI limited entry program. Eight permits were issued to qualified vessels for the Ho'omalu (limited access) Zone; 12 permits were issued for the Mau Zone. Vessels were required to file their HDAR catch reports. The HDAR catch report system is the official source of monitoring data for decisions on continued participation in the fishery.

Ho'omalu Zone Vessels	Mau Zone Vessels
F/V Anna Riley	F/V Chris
F/V E.T.	F/V Dasher
F/V Fortuna	F/V Kia Hao
F/V Four C's	F/V Lei Alana
F/V Ipokai	F/V Maka Pueo
F/V Kawamee	F/V Nan Bellis Jo
F/V O Hana Kai	F/V Pi'i Ola
F/V Sail Fisher	F/V Sea Eagle
	F/V Taihei Maru
	F/V Wahine Kapaloa I
	F/V Wahine Kapaloa II
	F/V Windwalker

II. Fleet Operations

During the first year of the limited entry program 5 Ho'omalu and 5 Mau Zone fishing vessels regularly made fishing trips to the NWHI and landed bottomfish. The other ten vessels with NWHI permits (3 Ho'omalu, 7 Mau) did not report participation in the fishery; they were engaged in other fisheries such as, tuna and swordfish longline, deep-sea shrimp, albacore troll, and lobster. The active bottomfish vessels made 50 trips to the NWHI, each lasting an average of 14.8 days. Bottomfish landings per trip averaged 5,036 pounds; landings from

the Ho'omalu Zone were slightly higher at 5,483 pounds per trip as compared with those from the Mau Zone (4,467 pounds). Also, bottomfish catch per day of fishing was higher in the Ho'omalu Zone. Revenues for Mau vessels were $375 higher per trip than for Ho'omalu vessels; however, total revenues for Ho'omalu Zone vessels averaged $16,147 (24%) more than for the Mau vessels. Fishery participation information is summarized in Table 1.

Table 1. Activity of bottomfish vessels in the NWHI limited entry program (source: Kawamoto and Pooley 1990)

Calendar 1989	Mau	Ho'omalu
Active Vessels (No.)	5	5
Trips (No.)	22	28
Trips/vessel (No.)	4	5
Days/trip	12.5	16.6
Bottomfish/trip (lbs.)	4467	5483
Total catch/trip (lbs.)	5719	6318
Bottomfish/fishing day (lbs.)	677	808
Revenue/trip ($)	15204	14829
Revenue/vessel ($)	66898	83045

III. Economic Assessment

Pooley and Kawamoto (1990) collected cost data for the 1987 fishery year from 7 active NWHI bottomfishing boats. These data were combined with operating and catch data compiled from the NMFS shore side monitoring program in Honolulu to construct an integrated Income Statement for the "average" and "annualized" vessel in 1987. The "average" vessel represents the weighted average of the entire fleet operating in 1987, while the "annualized" vessel determines prototypical operating parameters as if the vessel were at sea 250 days during the year. These results were then extrapolated to 1986 and 1988-89 using the same per day at sea cost data and revised operating and revenue characteristics.

The results indicate that the operating characteristics and catch rates for this fishery have been so stable that no discernable trend emerges from the Income Statements. Annualized gross revenue (adjusted for inflation) varied only between $249,000 in 1986 to $283,000, dropping to $259,000 in 1989. Catch rates and prices varied in a similar narrow band. As a result, inflation-adjusted net revenue has varied by only $13,000 over the four years, less than 5% of investment value.

The limited entry plan calls for an annual calculation of the relationship between total revenue and total cost for the fishery to determine whether the Ho'omalu zone can sustain increased fishing. Unfortunately there are two major flaws in the economic estimates required for this determination: the basic cost-earnings work was compiled for fishing in the NWHI as a whole, and not the Ho'omalu zone in particular; and there is no perceivable relationship between fishing effort and catch rates with which to predict the impact of new entry. While we could calculate costs based on distances traveled, there exists no catch rate information properly differentiated by Ho'omalu and Mau zone.

The number of FTE (full-time equivalent or annualized) vessels which could take the MSY in the Ho'omalu zone (602,000 pounds) and break even financially is 7.2 FTE vessels (abstracting from effort and CPUE effects). There were 2.2 FTE vessels operating in the Ho'omalu zone in 1989 (the actual number was 5 vessels). Whether this indicates the Ho'omalu zone can sustain an additional 5 FTE vessels (or up to 10 part-time vessels) is debatable.

Table 2. Annualized Vessel Performance

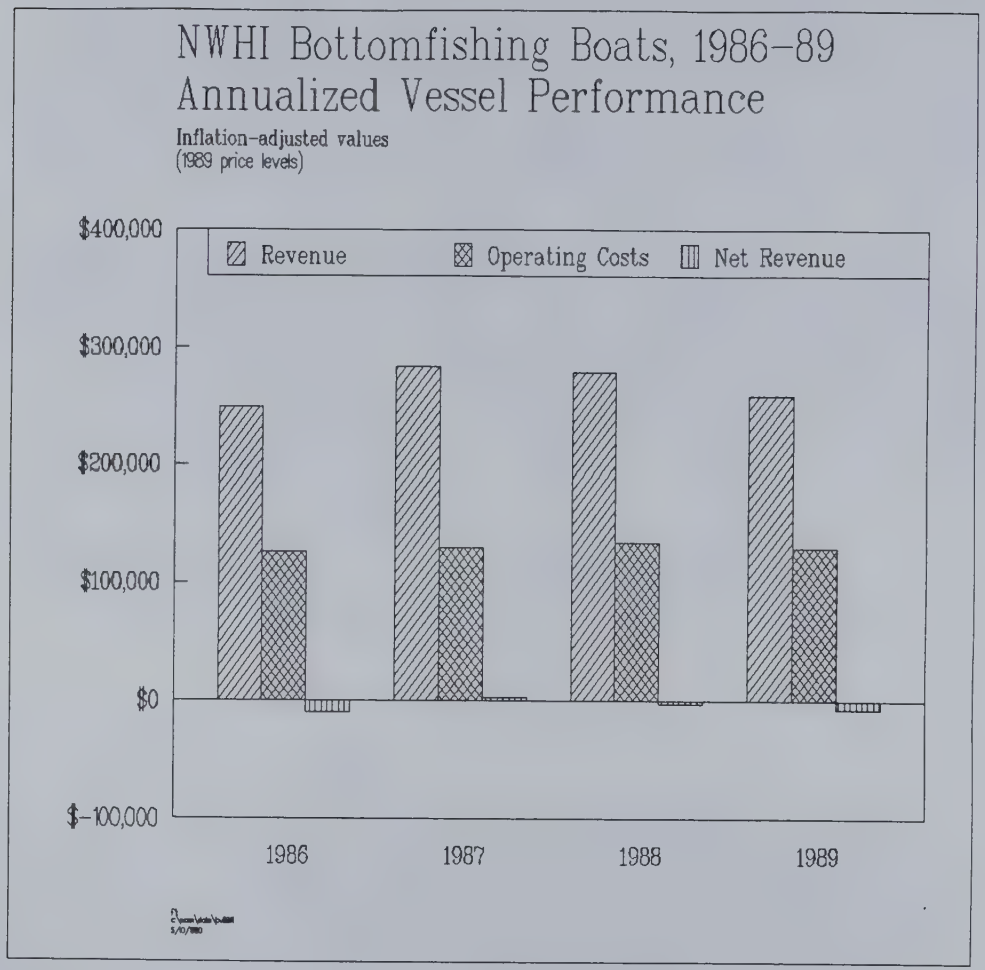
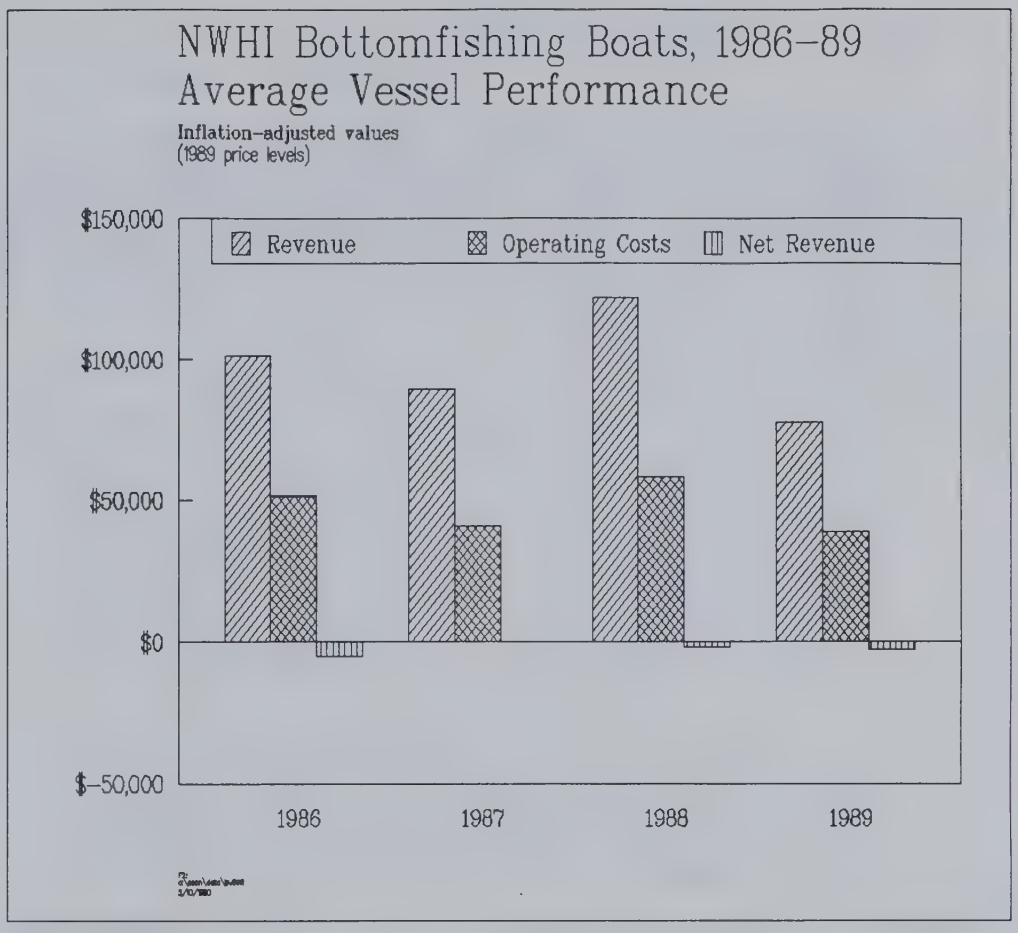


Table 3. Average Vessel Performance



IV. Program Issues/Problems

- o Illegal bottomfishing activity in the Ho'omalu Zone

  NWHI bottomfish fishermen alleged that a few unauthorized vessels illegally bottomfished within the limited access zone. Although non-permitted vessels are prohibited from bottomfishing within the zone, they are allowed to transit through the area or fish for species other than bottomfish (e.g. tuna and swordfish longlining and lobster).

- o Data Collection

  All NWHI bottomfish fishermen with Federal permits must report their catches to the State of Hawaii, Division of Aquatic Resources (HDAR). In 1989, 20 percent of the NWHI permit holders, mostly Mau Zone fishermen, did not submit catch reports which is reflected in the bottomfish information compiled by the HDAR and Honolulu Laboratory's Fishery Management Research Program (HL) (Table 4_). In December 1989, a program to improve reporting of catch information by NWHI bottomfishers was established jointly by the

  Western Pacific Fisheries Management Council, Hawaii Division of Aquatic Resources, National Marine Fisheries Service (Enforcement, Southwest Region), and U.S. Coast Guard. (See also NMFS Administrative Actions, Appendix 2)

Table 4. Comparison between HDAR and Honolulu Laboratory NWHI bottomfish effort data for 1989.

Report	HDAR Data	HL Data	Diff
Total NWHI trips (No.)	41	50	9
Ho'omalu trips (No.)	26	28	2
Mau trips (No.)	15	22	7
Bottomfish catch/trip (lbs.)	5312	5036	276
Ho'omalu " "	5012	5483	471
Mau " "	5831	4467	1364

Appendix 4
Protected Species Interactions

As required under federal regulations (50 CFR Part 683), commercial bottomfish fishermen permitted to fish within the management area of the Northwestern Hawaiian Islands (NWHI) must report any interactions with marine mammals, threatened species or endangered species. For the 1989 reporting year NMFS received no official notification of such interactions during commercial bottomfish operations in the NWHI.

Under the provisions of 50 CFR Section 683.25, the Protected Species, Branch, Pacific Area Office, NMFS, conducted protected species seminars for 10 captains, including relief captains, of vessels permitted to fish in the Ho'omalu Zone in 1989.

Appendix 5
1989 Enforcement Report

Enforcement Activities:

United States Coast Guard aircraft and surface patrol activities in the EEZ of the Northwest Hawaiian Islands (NWHI) are depicted in Table 1. In 1989 Coast Guard C-130 aircraft logged 93.0 hours of foreign and domestic fisheries patrol covering approximately 20,800 miles in the EEZ of the NWHI. Surface vessels patrolled the NWHI EEZ for 39 days covering approximately 4,290 miles.

Complaints were received alleging Mau Zone fishermen were fishing in the Ho'omalu Zone. A Coast Guard c-130 patrol was launched and the Ho'omalu patrolled, search for non-permitted vessels. No violations were detected during this patrol.

Several meetings were held with the Department of Land and Natural Resources, Division of Aquatic Resources (HDAR), working out an agreement where HDAR is to submit a status report of the submission of fish catch reports by commercial fishermen who were issued bottomfish permits for the NWHI.

Several reporting discrepancies were identified and subsequently corrected by a reminder letter for Southwest Regional Director Fullerton. All reports are current with the exception of one vessel that had departed the area and fishery.

There were no reports or detection of illegal gear or fishing methods in the NWHI.

Recommendation:

The current management plan is working well with the exception that all NWHI boats and gear should be required to be marked with their permit number.

TABLE 1
WESTERN PACIFIC FOREIGN FISHERIES ENFORCEMENT REFORT

MONTH	C-130 AIRCRAFT PATROLS MILES 1990	MILES 1989	HOURS 1990	HOURS 1989	SURFACE VESSEL PATROLS MILES 1990	MILES 1989	DAYS 1990	DAYS 1989	TOTAL MILES PATROLLED 1990	PATROLLED 1989	FFVS SIGHTED WITHIN US EEZ 1990	WITHIN US EEZ 1989
January	675	3,290	3.0	14.6	1,075	1,450	8	11	1,750	4,740	3	0
February	3,532	4,060	15.7	17.8	1,769	1,610	8	13	5,301	5,670	9	1
March	1,800	6,313	8.0	29.5	131	2,280	1	20	1,931	8,593	7	2
April		2,070		9.2		740		7	0	2,810		1
May		2,655		11.3		520		6	0	3,175		0
June		1,800		8.0		1,320		11	0	3,120		3
July		1,215		5.4		1,152		12	0	2,367		1
August		2,362		10.5		1,248		13	0	3,610		0
September		0		0.0		2,024		20	0	2,024		0
October		1,263		5.6		1,224		12	0	2,487		0
November		3,915		17.4		1,136		10	0	5,051		3
December		2,182		9.7		1,237		10	0	3,419		7
Totals	6,007	31,125	26.7	139.0	2,975	15,941	17	145	8,982	47,066	19	18

09/04/90

TABLE 2
PATROLS BY GEOGRAPHIC AREA (1989)

VESSEL DAYS

	AREA									
	MHI	NWHI	GUAM/CNMI	J.I.	H & B	AM. SAMOA	JARVIS	WAKE	PALMYRA	TOTAL
January		11								11
February		9		4						13
March		11		6	3					20
April		2		5						7
May		3		3						6
June		9		2						11
July		9		3						12
August		9		4						13
September		17		3						20
October		11		1						12
November		11		1						12
December		3		7						10
TOTALS		105	0	39	3	0	0	0	0	147

AIRCRAFT HOURS

	AREA									
	MHI	NWHI	GUAM/CNMI	J.I.	H & B	AM. SAMOA	JARVIS	WAKE	PALMYRA	TOTAL
January			14.6							14.6
February		5.8	12.0							17.8
March		10.2	11.3	8.0						29.5
April		2.0		7.2						9.2
May		4.5	6.8							11.3
June		3.6	4.4							8.0
July			5.4							5.4
August			10.5							10.5
September										0.0
October			5.6							5.6
November			17.4							17.4
December		4.7	5.0							9.7
TOTALS		30.8	93.0	15.2	0.0	0.0	0.0	0.0	0.0	139.0

KEY: MHI: Main Hawaiian Islands
NWHI: Northwest Hawaiian Islands
JI: Johnston Island
H&B: Howland and Baker

09/04/90

TABLE 5

1989 FOREIGN FISHING VESSEL SIGHTINGS

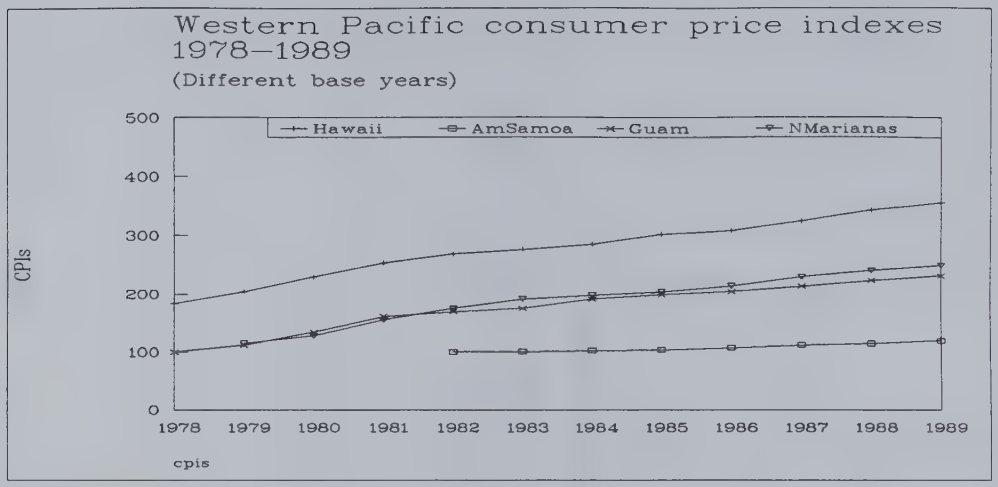
MONTH	LL	PL	OT	TOT	LL	PL	OT	TOT	LL	PL	OT	TOT	LL	PL	OT	TOT	LL	PL	OT	TOT
January				0				0				0				0	0	0	0	0
February	1			1				0				0				0	1	0	0	1
March	1		1	2				0				0				0	1	0	1	2
April	1			1				0				0				0	1	0	0	1
May				0				0				0				0	0	0	0	0
June		1	1	2			1	1				0				0	0	1	2	3
July	1			1				0				0				0	1	0	0	1
August				0				0				0				0	0	0	0	0
September				0				0				0				0	0	0	0	0
October				0				0				0				0	0	0	0	0
November	3			3				0				0				0	3	0	0	3
December	7			7				0				0				0	7	0	0	7
Totals	14	1	2	17	0	0	1	1	0	0	0	0	0	0	0	0	14	1	3	18

NATIONALITY OF FOREIGN FISHING VESSELS SIGHTED

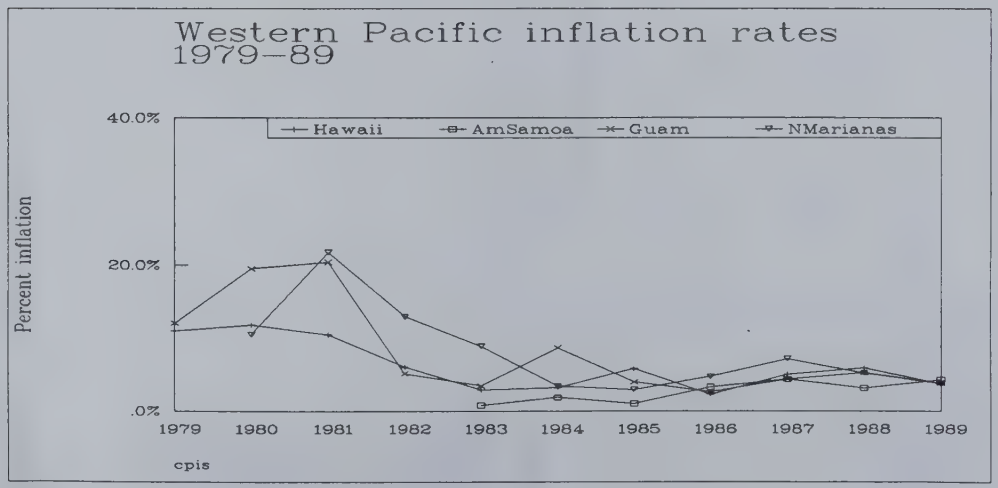
MONTH	JA	KS	TW	PN	UNK	OTHER	TOTAL
January							0
February	1						1
March	2						2
April	1						1
May							0
June	2		1				3
July	1						1
August							0
September							0
October							0
November	3						3
December	6	1					7
Totals	16	1	1	0	0	0	18

09/04/90

Appendix 6. Western Pacific consumer price indexes



In time-series of prices and revenues, it is appropriate to adjust value for the rate of inflation so that values throughout the time period are comparable (based on a consistent purchasing power for the dollar). For Hawaii, we have chosen to adjust prices and



revenues in these reports to 1989 price levels using the consumer price index (CPI). For the other areas, aggregate price was adusted using the CPI for each respective area. These charts show the CPIs for each area, and the rate of inflation they indicate. Each CPI uses a different base year, so the absolute values of the CPIs charted in the top box are not comparable. The rates of change shown in the bottom chart, however, are comparable. Notice also that the CPIs for Guam, and the Northern Mariana Islands exceed that for Hawaii substantially for some of the early years in the time-series. Whether this represents a calculation problem is not known at present.

Western Pacific consumer price indexes

YEAR	HCPI	ASCPI	GCPI	NMCPI
1978	184.10		100.00	
1979	204.50		112.10	115.40
1980	228.70		134.00	127.60
1981	252.80		161.40	155.40
1982	268.10	100.0	169.70	175.60
1983	275.90	100.8	175.60	191.30
1984	284.80	102.68	190.90	197.80
1985	301.40	103.72	198.50	203.60
1986	308.20	107.13	203.70	213.20
1987	323.80	111.80	212.70	228.50
1988	343.05	115.28	223.80	240.40
1989	355.90	120.25	232.30	249.50

HCPI: Hawaii consumer price index
ASCPI: American Samoa
GCPI: Guam
NMCPI: Northern Mariana Islands